

**(Moderator Brooke):** Welcome to this evening's web chat with the head of NASA's Meteoroid Environment Office, Dr. Bill Cooke. He specializes in the meteoroid environment and its effects on space vehicles of all sorts. Our topic tonight is the Perseid meteor shower, which have been ongoing all week, with peak tonight and tomorrow night. Please remember to stay on topic! This is a moderated chat. It may take a few moments for the queue to catch up to your questions, so please don't leave if you don't see your question right away.

**sammmeeee:** When does the shower start?

**Bill:** It's already started several days ago. : ) Tonight is the peak and you can start seeing Perseids around 10 p.m. local

**jason\_cooke:** Bill are you from Alabama?

**Bill:** Yes, I am.

**fourcallstars:** I'm in Florida...which direction should I be looking?

**Bill:** Lie on your back and look straight up.

**fire123gary:** I seen 1 at 9: 30 p. m. in Fairmont W.V.

**Bill:** Congratulations! We've seen three so far.

**rafael\_diniz\_br\_:** Hello I am of Brazil more specifically from sao paulo like to know the correct time that the phenomenon could be seen

**Bill:** From 10 p.m. to dawn. There will be more towards dawn.

**az6396:** What direction should I look?

**Bill:** Straight up. Lie on your back and look toward the zenith.

**Claus:** Bill - beautiful clear sky here in Lauderdale County (50-miles west of MSFC)

**Bill:** Happy viewing!

**NASATOYMAN:** **Bill:** what is the average time to look up before you will see one?

**Bill:** Right now, we in Alabama are seeing one every 30 minutes or so -- but these are fireballs.

**space\_cat:** First day of school is tomorrow. Need to go to bed. Will there be a good show tomorrow?

**Bill:** The meteor rates will be half that of tonight, but you'll see Perseids if the weather is clear tomorrow night.

**nasasucks:** where do you have to look from Ohio to see it?

**Bill:** Straight up. Lie on your back and look toward the zenith.

**Mitch:** The live feed... is that looking straight up?

**Bill:** Yes, it is.

**Corey:** Just saw two directly overhead in middle Georgia

**Bill:** Congrats!

**Johnson:** My 2 sons and I have seen 15 in 10 min of observation here in middle North Carolina

**Bill:** That's great!

**sageyelm:** How many do you think will occur in an hour's time?

**Bill:** As many as 80 to 100 between 3-4 a.m.

**jennayangel:** Raining here in Maryland I can't see anything : (

**Bill:** Sorry about bad weather. Hopefully you can see some tomorrow.

**venura:** Saw 15-20 yesterday. today going to set up a camera and hopefully can do a good time-lapse!

**Bill:** Good luck!

**buster2295:** How many do you estimate will be around at approximately 4: 00 am, Atlantic Time, Bill?

**Bill:** 80 to 100 an hour

**az6396:** How many should I have seen in Indianapolis?

**Bill:** Not many right now. Best viewing before dawn.

**az6396:** Do they make noise?

**Bill:** No, but you can detect them with HAM radio and they make chirps, whistles, pings out of the speakers.

**Bill:** Hi everyone -- for local viewing, check out this blog post for advice! [http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

**SABP:** What makes the meteors "sing"?

**Bill:** Meteors don't really sing, but they chirp and whistle when picked up by HAM radio (like you can hear on the embedded live feed).

**aclassicaleducation:** We're hoping the clouds will clear in Huntsville for a view of the meteor shower!

**Bill:** Me too!

**ALAMO:** How fast are the meteors going?

**Bill:** 130,000 mph.

**(Moderator Jason):** *Hi everyone. Welcome to tonight's "Up All Night" web stream and chat for the Perseids Meteor Shower. At the bottom of the chat window there are two boxes -- Ask and Send. To chat with everyone in the room, use the bottom box (white) and click send. To ask Bill a question, type in the top box (yellow) and click Ask on the right side of the window. Please try to stay of topic. Persistent off-topic posters, plus those who personally attack others, post spam and post profanity, sexually explicit or discriminatory material will be gagged and lose chatting privileges. Thanks and enjoy the meteor shower.*

**AdelleVine:** Anything happen yet?

**Bill:** Here in the area we've seen four fireballs.

**didacticdialect:** Will the camera feed that is located on top of these chat box be able to show the meteors when they become visible?

**Bill:** You should be able to see the brighter meteors, yes.

**elizabeth:** What is the zenith?

**Bill:** It's the point in the sky straight overhead.

**Mitch:** And what sounds can you hear is like a coke bottle type sound?

**Bill:** Yes, it is, actually.

**SpYkMo:** What's the difference between the Perseids and Leonids?

**Bill:** Perseids are debris ejected from comet Swift Tuttle. Leonids come from comet Tempel-Tuttle. Two totally different comets, two different meteor showers.

**hannahf:** Bill, last night I was walking up my stairs to my front porch. I looked up and noticed how beautiful the stars looked. I heard a loud WHOOOSH HHHH and saw a HUGE meteor streak across right above me and left small particles behind it for about 5 seconds lighting up the sky. How could I hear it if it's in space?

**Bill:** It was in the atmosphere and meteors that are close to the ground can make sonic booms.

**CraigNASA:** I am getting up at 3:00 to see the show!

**Bill:** That's a great time to go out and view.

**foghorn124:** What makes the noises?

**Bill:** If you mean the live feed, the meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**didacticdialect:** How long will this last? in other words if I can't see any because of the bad weather here in MN, will I be able to catch them for a few more days?

**Bill:** Yes, but the rates will be much lower. you can see Perseids throughout the weekend.

**Nia:** Will we be able to see anything on the live feed provided by NASA?

**Bill:** Yes, if they're bright. Also try [www.spaceweather.com/video](http://www.spaceweather.com/video)

**(Moderator Brooke):** *Hi everyone. Welcome to tonight's "Up All Night" web stream and chat for the Perseids Meteor Shower. At the bottom of the chat window there are two boxes -- Ask and Send. To chat with everyone in the room, use the bottom box (white) and click send. To ask Bill a question, type in the top box (yellow) and click Ask on the right side of the window. Please try to stay on topic. Persistent off-topic posters, plus those who personally attack others, post spam and post profanity, sexually explicit or discriminatory material will be gagged and lose chatting privileges. Thanks and enjoy the meteor shower!*

**scuro:** Hi, you say 10pm local time, and best between 3-4am local time... why do you say 3-4? Is it particularly darker then?

**Bill:** The radiant is higher in the sky, which means you'll see more meteors. I say 3-4 a.m. to give people time to get out and get their eyes adapted to the dark.

**Spaceboy:** How do they make noise if space is a vacuum?

**Bill:** They don't make noise. you hear noise from the HAM receiver as the radio waves are bounced off the ionization trail of the meteors.

**Nia:** Bill, when will the live feed show something?

**Bill:** When there's a bright meteor.

**ddknndys118:** I would like to know, how is it best to find Perseus?

**Bill:** Perseus is a constellation off to the northeast from the United States, but you should look straight up, not at Perseus.

**zasx20:** Will an Am/Fm Radio work for hearing them?

**Bill:** Sorry, no.

**scuro:** What's HAM radio?

**Bill:** Amateur radio.

**Deepsix:** Anyone have an idea whether the depth of a quarry would be enough to shut out ambient light at the edge of a small city?

**Bill:** If the sky is dark enough to see all the stars in the Little Dipper, then you're good.

**buster2295:** As you said about picking them up on a HAM radio, would it work as well on a CB Radio..?

**Bill:** No, wrong frequencies

**James\_W:** How much is a meteor worth? Hoping one will fall in my backyard...

**Bill:** Meteorites can be worth lots of money to collectors. Check out [meteorites.com](http://meteorites.com) for some prices.

**Photon:** How large are the ice and/or dust particles that we end up seeing as meteor's?

**Bill:** Generally 1 mm to several cms. The bigger, the brighter!

**zasx20:** Can you hear it with a normal radio?

**Bill:** No, can't hear it on that.

**Florian\_Richter:** Hey Bill! I already saw 8 shooting stars here in a small town next to Halifax, NS. Is it worth to get up at 3am?

**Bill:** I think so. : )

**Marcy:** How fast are the meteors going?

**Bill:** 130,000 mph

**TMiss:** Bill, is the planetary alignment still visible or did I miss that?

**Bill:** It will be visible tomorrow (Friday) evening after sunset.

**jordankdogs:** Where can I watch it online?

**Bill:** There's a live feed embedded above this chat module and you can go to [www.spaceweather.com/video](http://www.spaceweather.com/video)

**kathyholb:** Bill is unusual for the sky to be so quiet, especially with the activity you had last night?

**Bill:** The activity last night didn't start until after midnight, so it's relatively quiet before then.

**McWerf:** Do you think a nice small consumer camera at 6 megapixels will be able to catch anything? How about while recording?

**Bill:** If it can do time exposures up to 5-10 minutes, then yes.

**annuhamazing:** Around what time will we have a better chance to see meteors on the Live broadcast?

**Bill:** After midnight and before dawn.

**tteya:** Why is nothing happening ?

**Bill:** It's still early, but we're already seeing meteors. Be patient!

**khar65:** what are fireballs?

**Bill:** Fireballs are meteors brighter than the planet Venus.

**Nia:** This is interesting. Bill, I noticed before a single blinking star. Then it went away. Now there is this very bright star. Could that be the alignments?

**Bill:** No, you may have seen a satellite or iridium flare.

**g:** What is a meteor composed of?

**Bill:** A Perseid is composed of ice mixed with dust and some organic chemicals.

**brian5s:** Will any of these meteors enter the atmosphere and hit the ground? If they do, is there one certain area that would be more affected than others?

**Bill:** Perseids being bits of ice won't survive to the ground. They burn up 56 miles overhead.

**kathyholb:** Bill can you check these spammers?

**Bill:** We're working on that right now. A shame people have to ruin a good thing!

**sebastian:** Bill How long has the Perseid constellation been around?

**Bill:** Since the galaxy was born. : )

**(Moderator Jason):** Hi everyone. We understand that the room is overrun with off-topic posts. We're working to gag users and allow everyone asking questions about the meteor showers to see them. Sorry everyone that we've got so much off-topic chatting.

**Estr\_Bien\_Czvoch:** Are the mods just chatroom mods or are you real scientists?

**Bill:** We're real. : )

**mpurischlotter:** This chat is not up to NASA standards!!

**Bill:** We tried to go on the "honor system" and that didn't work out. This is now back to being a fully moderated format. Sorry for the inconvenience to everyone. Now back to chat...

**Anonymau5:** I just saw 10 meteors

**Bill:** Great!

**Cassi\_Gee:** Are the meteor's sounds audible to our ears?

**Bill:** No, the meteor doesn't make sounds.

**Tony99:** Bill, I know most of the comets are about the size of a grain of sand. What is the diameter of the "fireball" when the meteor becomes visible from earth? I would think a "fireball" the size of a grain of sand would be all but invisible. I assume the fireball surrounding the meteor is several times larger than the meteor itself. Is this true? Thanks.

**Bill:** Most Perseids are about 1 mm across. Fireballs are several cms across.

**CHARSDUKE:** What are the lights on the live stream video?

**Bill:** The lights are from the various building here at Marshall Space Flight Center.

**schwarzschild:** How likely is it for debris to hit a satellite or spacecraft, and has it ever happened?

**Bill:** The Perseids have damaged 2 satellites but there are hundreds up there so not very likely.

**UnclePunky:** How do they react w/VanAllen belt?

**Bill:** They don't.

**Vinny\_Bob:** Dr. Cooke.... when is the best time to look for "grazers" or meteors with the potential to leave long and colorful trails? Early or late tonight? Just wondering...

**Bill:** Early in the evening around 9-9:30 is the best time.

**scuro:** Are chats always like this?

**(Moderator Jason):** *Sorry about that. We had attempted to allow everyone to share their experiences with watching the meteor showers -- who was seeing what and where -- however, a few rotten apples ruined that experience. We're back to a fully moderated chat. We love answering on-topic questions about tonight's Perseid meteor shower. To ask one, simply type your question in the yellow box on the bottom of the chat window and click the 'Ask' button on the right. Thanks!*

**AlyssaMM:** I have been watching for the meteors since 10, is there a certain direction in which to look? I haven't seen any yet.

**Bill:** Look straight up into the sky overhead. Be sure you're away from lights.

**gmlg13:** What does Perseids mean?

**Bill:** Come from the constellation Perseus and Perseid means "of Perseus."

**kdjkq:** Bill, when is the best time to watch the meteor shower?

**Bill:** Try this blog post:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

**andrew:** What is the shutter speed and aperture I need to set for it?

**Bill:** Expose for 5-10 minutes and open the iris all the way.

**James\_W:** I seen a meteor trail that was orange in color, is that normal?

**Bill:** Yes, you may also see yellow or white ones. Some people also see green meteors.

**tteya:** Can you still see the shower throughout the weekend?

**Bill:** Yes, but at greatly reduced rates.

**abeverick:** Bill, does it matter what direction I look toward?

**Bill:** Look straight up and don't look toward Perseus.

**ore0911:** How often are these showers?

**Bill:** Perseids occur every year. The next big shower will be the Orionids in October. They're pieces from Halley's Comet.

**schwarzschild:** How far do the meteors get before they burn up?

**Bill:** Perseids burn up 56 miles overhead.

**astroports:** How fast do the comets move across the sky?

**Bill:** Comets move very slowly across the sky, so slowly that you would have to watch them over several days to see their motion. Meteors move very quickly across the sky because they're only a few 10s of miles away, whereas comets are millions of miles away.

**michris1:** Is there any particular area that is prone to meteors than others?

**Bill:** On Earth, no.

**breakdancingbob:** Bill, is there going to be anything showing up on the Ustream by around 3AM?

**Bill:** Hopefully. : )



**Bill posts to the room:** Hi everyone -- you can go to [www.spaceweather.com/video](http://www.spaceweather.com/video) and see the latest fireball over north Georgia. There's even a movie of it!

**KJ:** Hello from North Georgia, USA - This is awesome!

**Bill:** Glad you're enjoying it!

**kimski:** Are the meteors into our atmosphere or are they flying by earth?

**Bill:** The meteors are in our atmosphere, burning up.

**Scia:** Hey bill if you where on mars would the meteors still burn up? or would the 1% density not be enough?

**Bill:** Yes, on mars the meteors would still burn up because Mars has an atmosphere -- a thin one, but an atmosphere.

**Bill posts to the room:** Hey everyone -- check this blog post for info on viewing the meteors in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html) Remember to look straight up, and find a place away from city lights.

**McWerf:** Am I still able to see well from around a 60 degree angle? My roof juts out a bit from my window so I can't look straight up

**Bill:** Need to see as much of the sky as possible. I'd recommend getting away from your house.

**MissKris:** What's an iridium flare?

**Bill:** An iridium flare occurs when sunlight is reflected by one of the satellite's antennas down to you. You'll see a slowly brightening flash that will then dim away. They can be quite bright.

**thedude:** Bill, I should be looking above Perseus correct?

**Bill:** You should be looking straight overhead.

**amacc:** How bright are they when they appear in relation to the brightness of the stars?

**Bill:** The Perseids can be of any brightness. Most are as bright as the North Star or brighter.

**AlyssaMM:** My question wasn't answered earlier... Which planets will be visible and how large will they be when viewing them with the naked eye?

**Bill:** Try this article -- very helpful:

[http://science.nasa.gov/science-news/science-at-nasa/2010/05aug\\_perseids/](http://science.nasa.gov/science-news/science-at-nasa/2010/05aug_perseids/)

**JoJordan19400:** When is the best time to watch the meteor shower?

**Bill:** After midnight and before dawn is best, with the best viewing 3-4 a.m. local time.

**gmlg13:** Is a Perseid a meteor?

**Bill:** Yes, it is.

**Mitch:** Is there a preferential direction besides straight up?

**Bill:** No, that's best.

**Nia:** This is a yearly thing, right?

**Bill:** Yes, every August.

**dfvaksdagkjsnf:** So, the time in which this all happens is all based on the local time, correct? I just wanted to double check. I'm in Tennessee and I saw 2 around 9: 30. Optimum viewing time is early morning, right?

**Bill:** That's correct, and it is based on local time.

**buster2295:** Bill, how come some stars I see are brighter sometimes, then they are 10 minutes later.

**Bill:** I don't know -- perhaps cirrus clouds?

**michris1:** What is the largest meteor that has been recovered and where did it land?

**Bill:** I don't know much about meteorites, which are meteors that make it to the ground. You'd have to talk to a meteorite person about that, or Google it. : )

**arjoe:** Bill, has there been much activity tonight yet?

**Bill:** So far, we've seen eight meteors, but the night is young!

**ladybugstar:** How often do meteors hit the earth?

**Bill:** All the time, but they rarely get through the atmosphere.

**gmlg13:** Can I listen on a radio and get the same effect?

**Bill:** No, afraid not.

**(Moderator Brooke):** *We're working on all the great questions you've asked us. Keep them coming! To submit your own question, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for your patience as we answer your questions.*

**ttom:** what is a meteor storm?

**Bill:** A meteor storm occurs when the hourly rate of meteors is 1,000 or over.

**mrei0922:** So the ice is just a vehicle and it's the dust and organics we see right?

**Bill:** No, you see the ice vaporizing as well.

**kOuellette:** How fast are the meteors traveling?

**Bill:** 130,000 mph

**Sabrina:** Bill, When are they going to be visible?

**Bill:** Best viewing is after midnight and before dawn, 80-100 per hour between 3-4. Make sure the sky is dark, no clouds.

**spacecadet:** We're in a heat wave in Nebraska. Will I still be able to see them?

**Bill:** As long as the sky is clear and dark, yes.

**wacba:** will it be possible to see the shower from Puerto Rico?

**Bill:** Yes, you can.

**bratsack:** On average, how many visible showers occur?

**Bill:** Over 30 per year.

**shooter88:** Is it possible for me to die tonight by getting hit by one of these meteors ??

**Bill:** No, they burn up 56 miles up.

**bkp53:** Will we be able to see them tomorrow, also?

**Bill:** Yes, but the rate will be about half.

**gs:** Can we see the meteor showers all over the US ?

**Bill:** Yes

**Off\_Seeker:** Bill, what is the approximate diameter of each of these meteors?

**Bill:** 1 mm to several cms.

**zigosh:** are you real?

**Bill:** I hope so!

**KJ:** Will we still be able to see them Friday night into Saturday?

**Bill:** Yes, at about half the rate as tonight.

**Scia:** Would an astronaut on the moon through a telescope be able to see the meteor shower?

**Bill:** Yes, s/he would.

**gabe:** About what time do you think it will pass above Brazil?

**Bill:** Best viewing after midnight and before dawn is the highest rate, about 80-100 per hour.

**kOuellette:** how fast are they traveling?

**Bill:** 130,000 mph

**WassHammoud:** in which direction should I be looking?

**Bill:** Look straight up.

**breakdancingbob:** Will we be able to see any more meteors tomorrow night?

**Bill:** Yes, but the rate will be lower by about half.

**ZoinksTHATSHOT:** What Makes The sounds that we hear ??? when meteors come

**Bill:** If you mean the live feed, the meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**TG:** what time will the meteors go till tonight?

**Bill:** They'll continue into daylight, but you'll be able to see them until dawn.

**sk8brdr:** How large are the meteors before they enter the earth's atmosphere and burn up?

**Bill:** The meteoroids are 1 mm to several cms across. The bigger, the brighter.

**tteya:** How do I become someone like you? This is really interesting stuff.

**Bill:** Study math, physics, and astronomy!

**Tony99:** Okay...I was wondering Bill (I asked this a few times) : I know most of the comets are about the size of a grain of sand. What is the diameter of the "fireball" when the meteor becomes visible from earth? I would think a "fireball" the size of a grain of sand would be all but invisible. I assume the fireball surrounding the meteor is several times larger than the meteor itself. Is this true? Thanks.

**Bill:** The streak of light produced by a meteor can be several miles long. You're correct -- you're not seeing the particle itself. You're seeing the ionization trail.

**UnclePunky:** Does it matter how far north you are?

**Bill:** No, it doesn't.

**RebeccaL:** Is it a possibility that Comet Swift-Tuttle will ever make a collision with Earth on a future pass?

**Bill:** Not as far as we know.

**spacecadet:** Will the temperature affect the visibility?

**Bill:** No, no effect.

**WendyxKong:** When the live stream video make noises, what does it suggest?

**Bill:** That a meteor is passing by.

**draa-lpac:** If a 1mm meteor hits a satellite, what's the damage? I assume they're designed for those types of impacts...

**Bill:** It can cut a wire or put a small crater in the side of a satellite. It depends on the satellite's design.

**Mitch:** is there a direction other than straight up? I heard north east?

**Bill:** No, the radiant is northeast. Don't look at the radiant, look straight up.

**anubia:** I haven't seen any so far.

**Bill:** Keep looking -- it's early.

**Tony99:** So the fireball is, say, 30-40 times the size of the meteor, correct?

**Bill:** The streak of light is millions of times the size of the meteor. The meteor is only 1 mm or so in size, the streak of light is at least the size of a battleship.

**Joao:** Can the video resolution improve at all>??

**Bill:** No, not possible with the equipment. It does the best it can. : )

**christye:** Is that the moon on the u-stream?

**Bill:** No, if close to the horizon it's building or parking lot lights.

**kOuellette:** Do you know how fast Perseids is traveling

**Bill:** 130,000 mph

**TG:** How large is the comet from which the Perseids come from?

**Bill:** The nucleus of Swift-Tuttle is about 10 miles or 16 km across.

**sebastian:** Bill, is this a yearly happening?

**Bill:** Yes, Perseids happen every August.

**Tony99:** Is there any chance there will be a few "extra large" meteors (larger than the 1 mm you mentioned)? If so, how large can they be from this particular shower?

**Bill:** Perseids aren't larger than a few cms in size. This is large enough to produce fireballs.

**annuh:** How common are green meteors?

**Bill:** Depends on your eye's color perception. : )

**CHARSDUKE:** What is the next big thing we will be able to see in the night skies?

**Bill:** As far as meteor showers, it will be the Orionids in October.

**Cliff:** Can the meteors be seen through light cloud cover?

**Bill:** Yes, if they're bright -- but they have to be REALLY bright.

**shooter88:** Do you still get excited over things like this meteor shower ?

**Bill:** YES! Absolutely.

**Bill posts to the room:** Hi -- we have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

**Kitt-Kat:** When will be the best time to view the planetary alignment? Or did I miss that already?

**Bill:** Try this link: [http://science.nasa.gov/science-news/science-at-nasa/2010/05aug\\_perseids/](http://science.nasa.gov/science-news/science-at-nasa/2010/05aug_perseids/)

**Philip:** In what year was your favorite meteor-watching experience and why?

**Bill:** 2001 Leonids from Hawaii. You can guess why. : )

**sageyelm:** I am 15 and this is my first meteor shower, any recommendations?

**Bill:** Go outside and enjoy the show. Find a place with dark clear skies. Look straight up overhead.

**simonwong1989:** Would viewing the meteors in the northern lights change the appearance of the meteor? If so, what color would it be?

**Bill:** No, no change.

**TG:** Tonight is the best night to see them?

**Bill:** Yes, this is the peak.

**gmlg13:** Why are they this time of year?

**Bill:** Because the Earth runs into the debris left behind by the comet Swift-Tuttle this time every year.

**loganmu07:** Bill, any tips on hastening the transition to our "night vision"?

**Bill:** No, you can't really hasten it. Just go outside and wait until you dark adapt.

**Lyko:** Does the Swift-Tuttle ever leave the solar system?

**Bill:** No, it doesn't.

**Kitt-Kat:** What's the difference between meteors and comets?

**Bill:** A meteor is a piece of a comet. Comets are much bigger than meteors!

***(Moderator Brooke):** Thanks for all the great questions! We're working to get through the questions. To submit a question, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for your patience!*

**cgurley1:** Bill, what would be a good novice telescope brand. Are there any you would recommend that don't cost an arm and a leg?

**Bill:** Unfortunately, there's really no such thing as a good, cheap telescope. :(

**michris1:** Are the colors associated to the heat such as color of flame or is there another reason for various colors?

**Bill:** The colors are mainly determined by how your eyes perceive colors.

**sk8brdr:** How long does it take Halley's comet to orbit the sun?

**Bill:** 76 years.

**Baumer:** Do any of the meteors hit the moon?

**Bill:** Yes, meteoroids hit the moon. You can see them with a telescope and a low-light level video camera.

**PrettyPoniesDanceAt\_Midnight:** The meteor showers seem to have ended...

**Bill:** Depends on where you are. If it's dawn where you are, then yes. Otherwise, best viewing is just before dawn.

**Natsumikan:** Do you have any helpful hints for those of us who have no choice but to view from in small cities/ subdivisions?

**Bill:** Just be patient. You'll eventually see a very bright Perseid.

**Rave:** If a Perseid were to be collected, what would it be constructed of?

**Bill:** Ice, dust, and organics. And probably a few surprises -- always surprises. : )

**spacecadet:** Has the space station ever been hit with a meteor?

**Bill:** Yes, but it didn't penetrate the armor. It's very well-protected.

**Maverick:** Is the swift-tuttle comet visible in the night sky as well? where do I point my telescope if it is?

**Bill:** No, it's too far away to be seen right now.

**coolj31:** Have airplanes ever been hit by meteors?

**Bill:** Not as far as I know.

**jjc\_in\_maine:** 17000 MPH right?

**Bill:** 130,000 mph for Perseids.

**ALAMO:** Is the Space Station crew watching the meteor shower? Where would they look?

**Bill:** They look down on the Earth -- it's a whole different perspective. The reason they don't look up is because there's practically no atmosphere where space station is at, 380 kms above Earth.

**JoJordan19400:** When is the next haleys comet?

**Bill:** 2061

**WendyxKong:** Bill, what direction is Perseus?

**Bill:** To the northeast, if you're in the U.S. But you don't want to look that direction. Look straight up.

**Nia:** Bill, should I wake up around 3am, and come back to this website. Would that give me a better chance of seeing something?

**Bill:** If you're referring to the live feed, you'll probably have a better chance around 3, but best bet at seeing a Perseid is to go outside and look up, if you have a dark sky. The video is far inferior to what you can see with your own eyes.

**cantsleep:** Can you see the shower anywhere in the United States?

**Bill:** Yes, you can. Equally good in all places, as long as the weather is clear.

**mozzer347:** Have you counted how many meteors you have seen in one night? and how many, if so?



**Bill:** Last night our camera in North Georgia saw 39 fireballs.

**Momma:** When would be the Ideal time to go out there?

**Bill:** Try this link:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

**Lyko:** Is the path of the comet Swift-Tuttle known?

**Bill:** Yes, it is. We know its orbit.

**nunya:** Are the meteor showing happening now?

**Bill:** Yes, tonight is the peak. Best viewing after midnight and before dawn local time.

**michris1:** When is the climax of is event?

**Bill:** Tonight, best viewing will be between 3-4 a.m. local time, estimated 80 per hour.

**gmlg13:** I have cloudy skies is there a chance that I can see any live

**Bill:** Unfortunately, no. :(

**sarabee:** How long is a single meteor visible for?

**Bill:** Anywhere from a fraction of a second to a few seconds.

**covarcia:** We haven't seen anything down here in Florida

**Bill:** Be patient. Best viewing will be close to dawn, but starts picking up after midnight. (Local time, of course.)

**MoushiKat:** Will it continue tomorrow also?

**Bill:** Yes, at about half the rate for tonight.

**not2bored:** How many years have your been observing the Perseids?

**Bill:** 39 years!

**gmlg13:** What is a fireball?

**Bill:** A meteor that burns as bright or brighter than the planet Venus.

**douglas15:** Can one meteor go from right to left in the sky.....and another go left to right?

**Bill:** Yes, they can travel in any direction.

**mdorin:** Why do these Perseids not bounce off the atmosphere?

**Bill:** They're going too fast at 130,000 mph.

**SkipDaddy:** AT what altitude are the meteors we are seeing as they streak across the sky?

**Bill:** When they burn up, they start at about 72 miles up.

**mdorin:** Where are you located?

**Bill:** At Marshall Space Flight Center in Huntsville, Ala.

**pawjam1963:** The sounds are awesome!

**Bill:** Glad you're hearing them. : )

**guerratj:** How many meteors per hour should we be able to see?

**Bill:** At the peak around 80-100 per hour. The peak will be around 3-4 a.m. local time.

**gmlg13:** are comets actually colorful like in the movies?

**Bill:** No, I don't think so. But hey, I've never been to one. : )

**Swift-Tuttle:** How long will I have to wait for the next meteor shower?

**Bill:** The next good one will be the Orionids in October.

**Nicole14:** So in Florida 3-4am is a good time as well?

**Bill:** Yes.

**DoctorWho\_Ellie:** When was your very first meteor seen? You personally?

**Bill:** Back when I was 13 years old. It was probably a Perseid.

**una\_lions:** Wow! you started observing Perseids when you were 2 yrs old? : )

**Bill:** I was a lot older than 2 years old. I will say no more. : )

**not2bored:** What was the best year your remember for viewing the Perseid meteor shower?

**Bill:** 1993 was probably the best year for Perseids, as I remember.

**Llefri96:** Why in the Ustream are some lighting balls in the sides?

**Bill:** Those are building and parking lot lights.

**gmlg13:** Do meteors travel in orbit?

**Bill:** Yes, they do until they hit the atmosphere and burn up.

**angel:** Hi, my name is angel jr I am 8 yrs old...what are the meteors made of?

**Bill:** Hi angel. You're up late! Meteors are made of bits of ice and dust.

**mdorin:** What are the sounds?

**Bill:** If you mean the live feed, the meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**Confucius7:** hi, I'm writing from Rochester New York. How do I see these things. my wife and cousin are going crazy ... please advise!

**Bill:** Go outside to a place with a dark, clear sky. look straight up at the sky overhead. Best viewing will be close to dawn, around 3-4 a.m. your local time (80 per hour)

**ldshinod:** Bill, what is your favorite planet (besides the Earth)?

**Bill:** I don't have a favorite besides Earth. : )

**WildEcat:** Could a Perseids cause the problems w/ the ISS cooling system? & do the people have to take any special precautions during a storm like this?

**Bill:** No, no connection. And no special precautions.

**JMBOHANNON:** Dr Bill ty for answering so many of our questions.

**Bill:** Thank you for asking so many great questions. : )

**Karen:** When will Hale-Bopp be visible to us again?

**Bill:** Many thousands of years from now. You won't have to worry about it. haha

**dr.gabochavarria1:** Is this happen every year?

**Bill:** Yes, Perseids happen every August.

**Taky:** When is the next opportunity after Perseids to see meteor shower?

**Bill:** The next good opportunity will be the Orionids in October.

**ladyrina83:** I have seen about 5 so far tonite in Florida.. but that's all

**Bill:** There will be more after midnight, best viewing closest to dawn.

**Llefri96:** Right now, what are we listening to?

**Bill:** If you mean the live feed, the meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**Cassi\_Gee:** are you outside viewing?

**Bill:** No, I'm inside a conference room with my team, viewing by camera.

**tahlina:** How long does it take for your eyes to fully adjust to the stars at night?

**Bill:** Give them about 45 minutes to dark adapt.

**JamesEitz:** And what area of the sky should be observed? SW?

**Bill:** Look straight overhead.

**Swift-Tuttle:** I thought the comet came every 133 years, how did you see this in 1993?

**Bill:** The comet leaves a trail of debris. The Earth passes through this trail once per year in August. It's the comet itself that passes every 133 years.

**stargazer:** Is there a remote possibility that any of these will reach earth?

**Bill:** No, they'll burn up about 56 miles overhead.

**A.V.Gast:** I got booted off..... I asked if I was able to see anything where I am in Galveston Texas (and when) ?

**Bill:** Best viewing is after midnight and before dawn, with best viewing right before dawn.

**sg1maniac:** Do the meteors accelerate when they enter the atmosphere?

**Bill:** No, they actually slow down due to atmospheric drag.

**Reaganomics:** Have we lost satellites or anything during one of these meteor showers?

**Bill:** Olympus in 1993, due to the Perseids.

**lucy:** Will Orionids be visible from the northern hemisphere as well?

**Bill:** Yes, they will be.

**turtle:** are we able to see them on the Ustream feed?

**Bill:** Yes, when they come along!

**gm1g13:** is there any place where the showers are not visible?

**Bill:** Try this blog post and look at the red shaded area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

**Bill posts to the room:** Hi -- we have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

Remember, dark clear skies away from city lights, look straight up overhead. Best viewing is after midnight, with peak of projected 80 per hour between 3-4 a.m. local time.

**Diane:** This is fantastic! Thank you for being here with us! By the way, are there any near Earth objects NASA is currently tracking? What is the likelihood of seeing something really large travel close to the Earth in the near future? (Sorry if this question was already asked)

**Bill:** Try JPL's NEO Office: <http://neo.jpl.nasa.gov/>

**Evie:** Are the chime-like tones I hear on the live feed the sounds of the ionized air molecules being reflected into the radio? I haven't seen anything, but I am hearing a lot of chiming.

**Bill:** It's the radio waves being reflected off the ionized air molecules that are being received by the radio. The chiming you're hearing are due to Perseids.

**MichelleC83:** What a beautiful and amazing experience this will be tonight. Things like these always leave me in awe. Thank you, Bill. For answering not only my question, but everyone else's as well. : )

**Bill:** It truly is my pleasure. : )

**turtle:** What do meteors sound like?

**Bill:** Meteors don't emit sounds.

**sailormoon:** Is this one of the best showers?

**Bill:** Yes, it is. The Perseids are usually the second best shower of the year. (The best is the Geminids, with rates of over 120 per hour.)

**Alec:** Why is the best time to see these meteors goes between 3am and dawn, how come it can't be at midnight or 1am ??

**Bill:** Because the radiant is highest in the sky just before dawn. The higher the radiant, the more meteors you see.

**puckslighthouse:** I may have seen a couple from the Ustream?!? : D

**Bill:** Awesome. : )

**gmlg13:** can you hear the meteors in real life?

**Bill:** No.

**(Moderator Brooke):** Thanks to all of you for the great questions -- keep them coming! To submit your own questions, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for your patience as we answer your questions.

**mdorin:** Do astronomers actually sit and watch the skies at night or it is all theoretical?

**Bill:** We actually watch the skies at night, but I'm kind of lazy, so I let computers and cameras do it for me. : )

**bocarpio:** Does the weather matter?

**Bill:** Yes, you can't see the meteors if the sky is overcast.

**gmlg13:** why straight ahead?

**Bill:** Straight up because you don't want to look close to the radiant. And when you're lying on your back, it's easy to look straight up. : )

**WildEcat:** So then, Earth is not the only planet that get "hit" with the comets trails as we pass through...would we be able to see a similar shower on Mars too if we were there & passed through a comet trail or is it only because of our atmosphere?

**Bill:** All planets run into debris left behind by comets.

**carolfensholt:** How are you able to predict a number like 80 per hour?

**Bill:** From past experience and computer models.

**DoctorWho\_Ellie:** What exactly are "Shooting Stars"?

**Bill:** The same thing as meteors.

**Bill1:** How many per hour can we expect at the peak?

**Bill:** Between 3-4 a.m. local time, estimated 80 per hour.

**mdorin:** Are these punching holes in the ozone layer?

**Bill:** No.

**lukekmyintthu:** So the trail of debris that the comet leaves is in the orbital path of earth around sun? If so, how come the debris lasts for 133 years or more in the earth's orbit around the sun? Aren't the meteors (debris) supposed to move?

**Bill:** Yes, but the comet leaves debris at places farther in its orbit and we also run into stuff that was left behind by the comet over the previous few thousand years. All of this is moving. The debris isn't in a clump but in a ring.

**douglas15:** Why do these meteors travel in different directions if they all came from the same comet tail?

**Bill:** Perseid meteors always radiate away from the radiant, meaning they're coming from the same direction. Sporadic or background meteors can come from any direction and come from different comets.

**JMBOHANNON:** On the outer edge of the Ustream are white dots what are they?

**Bill:** Just building and parking lot lights.

**lucy:** Thank you for taking our questions Dr Cooke! what exactly is the Ustream feed? is it just a camera pointed at the sky or is that the view through a telescope?

**Bill:** Hi lucy. It's a camera with a fish-eye lens so it can see the entire sky.

**gmlg13:** What is the ham radio?

**Bill:** Amateur radio.

**jlowery2121:** When is the Geminids?

**Bill:** In mid-December (Dec. 14).

**carolfensholt:** What is the radiant?

**Bill:** The radiant is the position in the sky from which the meteors appear to originate. (In this case, located in the Constellation Perseus.)

**LL1Chick:** Ok, this may sound meteor 101 ignorant, but why do the live cameras that make up the Ustream make a circle?

**Bill:** No, it's a good question. It's the fish-eye lens. it shows the entire sky.

**Ainslie\_Konner:** I see some twinkling lights in the sky, are those the shooting stars/meteors?

**Bill:** No, meteors are streaks of light, not twinkling points of light.

**DoctorWho\_Ellie:** Have you ever actually went INTO space?

**Bill:** No, I like Earth. : )

**retahogg:** Would the show be brighter if we were in a plane?

**Bill:** You'd have a smaller field of view, but you'd be above part of the atmosphere. Hard call to make. You'd have to have really good windows in the airplane, not the ones in passenger jets.

**DoctorWho\_Ellie:** In the sky, I know it's not a plane of some sort, and... it doesn't look to be a Satellite, but, there's these TEENY Tiny things that seem to move slowly and yet, sometimes swiftly. They look like tiny stars. They aren't blinking or anything. What could they be?

**Bill:** Those are satellites.

**jailer:** So about how many are we seeing now per hour?

**Bill:** International Meteor Organization is reporting 78 per hour in Europe.

**Alec:** "If" it were possible to touch a meteor, what would be the temperature of these meteors ?

**Bill:** In space, very cold. When burning up in the atmosphere at 130,000 mph, very hot.

**markhallii:** What is the most views per hour in the history of this "storm"?

**Bill:** Perseids are a shower, they never storm. Most that I know of (highest rate) is 300 per hour seen back in 1993.

**3Dradio:** I'm listening to the audio blips from the meteorites entering the Earth's atmosphere. How exactly does a meteorite translate into audio?

**Bill:** The meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**Imeteor:** How large is the comet?

**Bill:** Swift-Tuttle, whose debris gives us the Perseids each year, is 10 miles (16 kms) across.

**RXGOOGERS:** Do we have anything to fear by these "meteors"?

**Bill:** No, they burn up 56 miles overhead.

**kramu:** Do these meteor showers leave debris in the atmosphere?

**Bill:** No, it all burns up.

**RXGOOGERS:** Are meteors big?

**Bill:** Perseids range from 1 mm to several cms across.

**michris1:** When is Geminids?

**Bill:** Mid-December.



**diamondinthesky:** Is the comet heading toward or away from the sun?

**Bill:** Swift Tuttle is heading away from the sun right now.

**AnaAtkinson:** Do you need a telescope to see it?

**Bill:** Assuming Perseids, the naked eye is better for viewing the shower.

**kyler:** how far away from the city do I have to be able to see the meteors?

**Bill:** Far enough away for a dark sky.

**goober2:** Are there any simple factors that determine whether a given comet will produce a blip, ping, chime, whistle, etc.?

**Bill:** The size and speed determine the types of sounds.

**Dr.\_Guggenheim:** Which direction should I look?

**Bill:** Look straight up at the sky overhead.

**sebastian:** Bill when will this meteor shower end?

**Bill:** Perseid activity in the past has continued until Aug. 24, but the rates are very low at that time.

**McWerf:** How big are these meteors to the naked eye?

**Bill:** You can only see the streaks of light with the naked eye, not the meteoroids themselves.

**kyler:** On average how many showers does earth experience in one year

**Bill:** Over 30 showers per year.

**RXGOOGERS:** Does the name Perseid have anything to do with Poseidon?

**Bill:** No, Perseus.

**justin:** I live in Clearwater, Florida and I stood outside for ten straight minutes and couldn't see any...why not?

**Bill:** Were the skies clear? Were they dark? Also, you need to be outside for at least 45 minutes to give your eyes a chance to dark adapt.

**gmlg13:** How do u film the entire sky with one camera?

**Bill:** Yes, we do.

**stargazer:** If those are parking lot lights, then it appears we are looking down on them. Please explain the stream. Thanks!

**Bill:** The camera is on top of a tower, and the field of view is slightly greater than 180 degrees, so you see parking lot and building lights off in the distance.

**nattlee:** when I was outside earlier, why was one of the meteor tails red/yellow and the rest have just been white?

**Bill:** Color perception in your eyes. It would look different to someone else.

**(Moderator Brooke):** *Thanks for your questions! Keep those questions coming - we're here all night to answer them! To submit a question, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for your patience as we answer your questions.*

**ladyrina83:** I don't see anything on the live feed? has anything happened on it yet?

**Bill:** Yes. Also try this site: [www.spaceweather.com/video](http://www.spaceweather.com/video) There's always a recent video posted there.

**RXGOOGERS:** Are meteors radioactive?

**Bill:** No, they aren't.

**FunGUyPie:** Do you expect any of these meteors to actually hit Earth in a reasonable size?

**Bill:** No, they will burn up about 56 miles overhead.

**Bill posts to the room:** Hi -- we have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

Remember, dark clear skies away from city lights, look straight up overhead. Best viewing is after midnight, with peak of projected 80 per hour between 3-4 a.m. local time.

**Kearlee:** Why are you answering our questions? Is it your job? Did you volunteer? Did you lose a bet? Haha, just kidding! Little bit of coffee hype!

**Bill:** No bets lost -- I volunteered. : )

**meteorss:** Is every meteor we see tonight from the same comet?

**Bill:** No. Most are from Swift-Tuttle, but there will be some sporadic or background meteors.

**2405951069:** So how many fireballs will we see tonight

**Bill:** We don't know -- that's hard to predict.

**Jolene:** what time of the night is the best time to see the shower....I am in Washington state

**Bill:** Try this link -- it provides some great information about that:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

**McWerf:** Are you going to bring back public chat or was that ruined by the other users?

**Bill:** No, moderated chat will remain.

**LL1Chick:** This may have been answered, but I didn't see it in the above literature...So, what are the consistent stars (I'm guessing planets) that we can see through the Ustream? There seem to be approximately 5.

**Bill:** If they're not moving, those are hot pixels from the camera. : )

**FunGUyPie:** Do you expect any to actually hit the earth.

**Bill:** No, they'll burn up 56 miles overhead.

**TomK:** I see a lot of blue speckles of light in the sky (more than usual). Are these meteors or stars or satellites?

**Bill:** I'm not sure -- but those wouldn't be meteors.

**Jacob\_S:** Will comet Swift-Tuttle ever "evaporate" as it leaves dust size particles as it orbits near the sun?

**Bill:** Eventually comet Swift Tuttle will lose its ice and become a dead comet. This will take many thousands of years.

**ore0911:** When we will have a meteor storm?

**Bill:** No meteor storm for the next few years.

**alie:** so prime time to see the meteors is 3-4 A.M local time, right? : D

**Bill:** That's correct!

**Margie:** Has a meteor been spotted on the cam since its been up for viewing?

**Bill:** Yes, on both Ustream and the North Georgia camera.

**bocarpio:** Does the weather matter

**Bill:** Yes, clear skies are a must!

**RXGOOGERS:** Wait, we're talking about comets now? I thought these were meteors

**Bill:** Meteors come from comets, so the two are strongly related.

**tenhet44:** 3-4 AM PST right? For best viewing...?

**Bill:** Yes, that's right! As long as you have clear, dark skies.

**kunal436:** I am In NJ, so I should be able to see them at 3am?

**Bill:** Bingo. : )

**CHARSDUKE:** Just seen on a few minutes ago... nice and bright

**Bill:** That's great!

**guester82:** I have seen two things shoot across the sky tonight. However, one was moving south to north and the other

**east to west:** Is it possible for these meteors to move in different direction?

**Bill:** Yes, they can.

**Yevette77:** I am in Georgia ..When will the peak hours be?

**Bill:** Between 3-4 a.m. local time.

**Tammie-Lee:** Meteors are pieces of a broken comet, yes? And I note that the term asteroid is interchanged with the word meteor, is an asteroid a meteor?

**Bill:** Asteroids are much bigger than meteoroids, which are typically smaller than a few meters in diameters. Also, meteors aren't necessarily broken pieces of comets, but material that is naturally shed from the comet as it approaches the sun.

**leah375:** Will we be able to see a lot of activity tomorrow night?

**Bill:** It will be about half the rate that you would be able to see tonight.

**rebecaars:** In how many hours can we expect to see the meteors on the Ustream?

**Bill:** They're happening now -- you can see them until the sun comes up, and also each night through the weekend.

**time\_traveler:** How big would one need to be to reach the earth?

**Bill:** The Earth protects us against meteors smaller than a football field. It has to be really big to make it to the ground, unless it's made of iron.

**Bill posts to the room:** Hey everyone -- If you enlarge the Ustream screen to full size, you can start seeing the streaks from the Perseids!

**stephanie:** I keep hearing strange noises but I don't see anything on the stream why?

**Bill:** You'll hear more meteors that you'll see.

**aclassicaleducation:** How fast do space shuttles come in to the earth's atmosphere -- just wanted to compare to the speed of these meteors. Thank you!

**Bill:** The shuttle enters at about 16,700 mph, while Perseids enter at 130,000 mph. : )

**justin:** I can't tell exactly what the stream is showing, its circular the only movement is on the edge and there's no color or clearness to tell anything a part...some help trying to understand how to see things correctly on the stream ??

**Bill:** Ignore the dots-- look for streaks. Enlarging the Ustream window to full size helps, and visit [www.spaceweather.com/video](http://www.spaceweather.com/video) to see what they look like. And..they move VERY fast, 60 kms per second!

**RXGOOGERS:** Does it matter what time zone I'm in to see them?

**Bill:** No, just watch after midnight and before dawn, with best chance between 3-4 a.m. local time.

**beta5:** Why do they make such sounds when they come down?

**Bill:** The meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**A.V.Gast:** and this has been going on a very long time?????????

**Bill:** Perseids were first observed by the Chinese in 36 A.D. We've been seeing them ever since then.

**DoctorWho\_Ellie:** I am heading back out to watch for more! It's 1: 41am EST. I shall return with a really cool report! Enjoy guys!

**Bill:** Good -- looking forward to hearing it!

**RXGOOGERS:** Do meteors cause black holes?

**Bill:** No, no connections.

**MrTrevor:** In viewing this shower... is there a difference between being in the mountains & being somewhere as sea level?

**Bill:** If you're high enough in the mountains, you might be able to get above some of the atmosphere and possibly see more meteors than at sea level.

**spirit:** I don't think I'll be able to see anything tonight. it's pretty cloudy in hot springs, ar

**Bill:** You can try again tomorrow night -- rates will be about half of what they are tonight.

**sg1maniac:** Hypothetically speaking, is there a possibility that within the composition of the meteors there could be traces of different elements and that is why we see the different colors?

**Bill:** No, it's all about your eye's perception and the molecules of air that are ionized -- but mainly eye perception.

**bocarpio:** does the weather matter

**Bill:** Clear skies are a must.

**Kearlee:** Well Thank You very much for volunteering! : )

**Bill:** My pleasure. : )

**tripacer99:** I'm heading out to a rural area sometime tonight to watch this. What do you suggest I bring? (other than a camera, of course : P )

**Bill:** Bug spray. : ) And a blanket. And something to drink.

**RebeccaL:** What's the difference between fireballs and the normal meteors?

**Bill:** Fireballs are brighter than Venus -- normal meteors are less bright than Venus.

**audilynz:** How far away are these meteors?

**Bill:** They start at 72 miles above us, burn up around 56 miles above us.

**time\_traveler:** how fast are the meteors traveling?

**Bill:** 130,000 mph

**spirit:** does this happen every august?

**Bill:** It does. Perseids are an annual shower.

**FunGUyPie:** Are Perseids one of the larger showers from this year?

**Bill:** Yes, second only to the Geminids in mid-December. (Dec. 14)

**pspyxz:** How is it like to work with meteors and this kinds of stuff?

**Bill:** it's a lot of fun. You meet interesting people. You get to help spacecraft designers protect their vehicles, and you get to travel a lot.

**audiparis:** when will be the next meteor shower to be prepared.... : )

**Bill:** Geminids in mid-December.

**jbessey2010:** I hear a "humming" noise every now and then what is it?

**Bill:** That's a meteor reflecting radio waves back to the HAM receiver.

**Ulysses:** What is your favorite astronomical event?

**Bill:** I like solar eclipses.

**champion:** is this the largest shower of the year?

**Bill:** That will be the Geminids in December.

**mdorin:** Hi Bill, Do these hit the moon where there is no atmosphere and if so, what happens?

**Bill:** They hit the moon and leave a crater on the ground. This is a great site that talks about that:  
<http://www.nasa.gov/centers/marshall/news/lunar/index.html>

**TomK:** Will the meteors be visible over the weekend too?

**Bill:** Yes, but at greatly reduced rates.

**gdaym8:** I've actually counted 11 in the last 45 minutes...

**Bill:** Congratulations!

**goober2:** Are there any camera feeds that provide a view of the Perseids from space?

**Bill:** No, I wish!

**Guest:** How big would a meteor have to be to survive the atmosphere & impact the earth?

**Bill:** Larger than a football field. Our atmosphere protects us very well!

**ma052572:** hello from middletown, ohio copy..

**Bill:** Hello, Ohio. : )

**sunshineEMT:** I live in California and its about 10: 50, when will be the best time to go viewing?

**Bill:** Best time about 3-4 a.m. local time. Estimate 80 Perseids per hour.

**beta5:** is a dead comet still a comet? does it change? how? Does it still have an orbit? O.O!

**Bill:** It has an orbit, but a lot of dead comets look like asteroids to us -- we often confuse them.

**Twist:** I'm watching outside...and not seeing much. How's the weather looking so far on your video above? I haven't seen much there either.

**Bill:** It's hazy here in Huntsville, but we are seeing meteors. Are your eyes fully dark adapted? Have you been in the dark for at least 45 minutes?

**Graceful:** What should I see in the sky?

**Bill:** Streaks of light. Go here so you can see a video of what these look like:  
[www.spaceweather.com/video](http://www.spaceweather.com/video)

**A.V.Gast:** Is The North Georgia Camera on the web for every one??????

**Bill:** Yes, anyone can view. [www.spaceweather.com/video](http://www.spaceweather.com/video)

**Ulysses:** Make the evil clouds go away! ☹

**Bill:** I wish I could, but I'm no master of weather. NASA is working on that device. : ) ← Please note that this is a joke!

**kyler:** what gives a meteor its name

**Bill:** The constellation from which it appears to come.

**Jules77:** the "song" on the audio feed is almost constant now - does that mean so is the activity, even if we're unable to see it

**Bill:** Yes, that's right! : )

**mdorin:** My mom says that only men can be astronauts. I don't believe her. Is that true?

**Bill:** Women are certainly astronauts. There are two on the space station right now!

**justin:** so why won't comets and asteroids burn up like meteors do ...they say there's a risk of the end of mankind from asteroids

**Bill:** They're simply too big.

**Dexter:** have any meteorites that have been recovered been found to contain organic materials?

**Bill:** Yes -- but no signs of life.

**Darren:** Is there a good ballpark estimate for ISO speed and length of exposure to use for time exposure photography of the shower?

**Bill:** You mean you're still using film? : ) I don't have any recommendations, sorry!

**Natsumikan:** You said the size etc. determines the sound that the meteor makes -- can you be more specific? Like what kind of meteor will make which sound?



**Bill:** The big meteors produce very dense ionization trails which give rise to the whistles, whereas small meteors produce less ionization and they are the chirps.

**Andrew:** What stars are we seeing in the camera?

**Bill:** Those are hot pixels from the camera.

**Graceful:** My backyard faces South. If I look to the East, there's something extremely bright in the sky. Is it a star or a planet? Thanks!

**Bill:** That's the planet Jupiter.

**Yvette77:** Thank you for advising on the peak hours in Georgia! I just saw one : D YAY! But I will set my clock to wake around 3 am so I will be sure to see them during the peak hours!

**Bill:** Sounds like a plan!

**fredsaid:** The comet must have travelled trillions of miles over the millennia. How come it hasn't disappeared to nothing?

**Bill:** because it only loses its ice when near the sun, and that's only a small fraction of its orbit.

**RebeccaL:** I'm torn between staying here and learning more... or going outside and attempting again to see more. Should I wait until 3-4am and leave then? Also, will there be a transcript of this posted at a later time?

**Bill:** The answer to your question depends largely on the weather -- if clear, I'd go out now and take a look. Are you expecting fog or clouds to roll in? On the transcript, we should have one up next week. This will be a long one. : )

**EyeCnoMeatEors:** What is the location of the video stream?

**Bill:** Embedded on this page, and also: <http://www.ustream.tv/channel/marshall-space-flight-center>

**Darren:** What frequency / band is your amateur station listening on? My guess is something very high, like 120 meters or above?

**Bill:** It's tuned to a channel 4 TV station carrier.

**Ocala:** Hi! I saw two around one o'clock from central Florida! Why did they come from different directions?

**Bill:** Meteors can come from any direction. That's why it's useful to look straight up into the sky.

**HallieM:** The sounds are major and minor 3d intervals. G & B-Flat and G & B. Not really a question, but very cool!

**Bill:** : )

**Redneckgirl:** I'm not sure what you guys see on your end on the Ustream but I think the reason for all the questions on Ustream is because we are seeing a lot of interference on it... similar to the 'salt and pepper' on a television channel not properly tuned in to a station signal...

**Bill:** Thank you! You'll have a better view if you can enlarge to full size and watch for the streaks. Also, try this link, too: [www.spaceweather.com/video](http://www.spaceweather.com/video)

**brettgreen2010:** Morning greetins from England. Great show last night!

**Bill:** Good morning -- glad you had a good show. : )

**meteorchat:** Are the bright spots planets, or am I mistaken?

**Bill:** on the Ustream...if around the edges, those are parking lot lights. If small unmoving spots in the middle, those are hot pixels on the camera.

**EyeCnoMeatEors:** Why are stars not visible on the video stream?

**Bill:** Because the camera only sees bright meteors and there are no stars bright enough to show up at video rates.

**rebecaars:** where is this radio located in the same place as the camera? And how come we can't see as many meteors as we hear?

**Bill:** Yes, it is. You're hearing meteors that are much smaller and farther away than the camera can see.

**Ulysses:** What is the composition of Swift-Tuttle? I know its ice and dust - but water ice? or methane?...etc...

**Bill:** Water-ice. It's a big, dirty snowball!

**Blue\_Fire:** I just saw a very bright meteor, maybe a fireball, streaking up parallel to the bottom of Cassiopeia, and then a smaller meteor moving through Cassie nearly perpendicular to the other one. It seems like they are coming now from every different direction. Is this very common?

**Bill:** Yes, it is during the Perseids.

**RXGOOGERS:** Bill ,what is your actual job title?

**Bill:** Lead of the NASA Meteoroids Environment Office at Marshall Space Flight Center.

**PDesign:** Is there a certain direction I should be looking? This page says 'the meteors radiate from the direction of the constellation Perseus, is it helpful to figure out where that is, or just go outside and look up ?

**Bill:** Best to go outside and look up.

**ajosa:** At what time in the night tomorrow will we see the most meteors?

**Bill:** 3-4 a.m. just before dawn -- but the rates will be about half that they are tonight.

**dukeblue002:** any tips on taking pictures of the meteor shower?

**Bill:** Point camera up, leave shutter open 5-10 minutes, make sure the sky is dark.

**Imeteor:** So how long will it take for me to do what you do? Academically speaking?

**Bill:** Ten years including undergraduate school. : )

**kyler:** I am going to go watch now its 11 pst just to see how many we are getting per hour will report soon!

**Bill:** Great, let us know what you see.

**(Moderator Brooke):** *Hi everyone. Welcome to tonight's "Up All Night" web stream and chat for the Perseids Meteor Shower. To submit a question, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for your patience as we answer your questions!*

**wasntme:** has the space shuttle ever got pictures of meteors going by them?

**Bill:** We have pix of meteors in Earth's atmosphere taken by the space shuttle crew. The only way to see meteors is when they're burning up in the atmosphere. They're just too small and fast to see otherwise.

**mrchildress:** Can we see any other planets tonight

**Bill:** Check out this feature:

[http://science.nasa.gov/science-news/science-at-nasa/2010/05aug\\_perseids/](http://science.nasa.gov/science-news/science-at-nasa/2010/05aug_perseids/)

**mlondon:** how visible are the showers in cloudy skies?

**Bill:** They're not. Must have clear skies.

**jpcarson79:** Is the camera on? I'm seeing a blank screen above on the page...

**Bill:** It's up and running.

**DeepakChopra:** how bright are most of the meteors to be expected?

**Bill:** They will be brighter than the North Star -- some will be much brighter.

**DeepakChopra:** is this the only meteor shower we can expect for this year?

**Bill:** No, there are about 30 meteor showers each year.

**kidd:** What's the difference between a shower and a storm?

**Bill:** The rates. A meteor storm has rate greater than 1,000 meteors per hour.

**dr.gabochavarria1:** which is the rate for the Geminids?

**Bill:** 120 per hour, maximum.

**larryfike:** Do binoculars help, or do they obstruct your field of vision too much?

**Bill:** they reduce the field of view too much. Use only your eyes.

**dukeblue002:** I think it's so great of you to take time away from observing the meteor shower to chatting with us!

**Bill:** No problem. My cameras are doing all the work anyway.

**ANDY:** When looking at the shower, is it better to look in a certain direction, such as North East or something like that. I'm here in IL and never saw one before so I'm trying to know what to look for.

**Bill:** Look straight up overhead. check out this link -- it will help you know the best way to watch for the meteors:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

**DeepakChopra:** do the Geminids come from a different place?

**Bill:** Geminids come from an asteroid called Phaethon.

**eflindt:** how big is the average size of the meteors in this shower? what would you guess as to the largest size they would be?

**Bill:** average size is 1 mm, biggest is a few centimeters.

**mlondon:** do you know anything about seeing the shower in a cloudy sky?

**Bill:** Can't see meteors if the sky is cloudy

**biamonte07:** Will the meteors ever stop showing up every August?

**Bill:** The Perseid shower will be around for a long time.

**Design:** so if they hit the moon and they are made of ice, wouldn't that put water on the moon?

**Bill:** Some scientists think so.

**Jacob\_S:** I just saw a bright and fast meteor streak almost straight over head. If these are 72 miles high how far away from me would other people see the same meteor?

**Bill:** a person up to 200 miles away could see the same meteor

**Darren:** Since you don't know what frequency your HAM radio is using (I've already asked) to collect the skipwaves can you at least tell me what kind of antenna you're using? It's a neat idea and a shame there's no more information available. Who's the HAM operator running the station? I'd love to ask them about their setup, as it would be neat to do this for the other engineers at my company.

**Bill:** Go here for a description:

[http://www.nasa.gov/offices/meo/outreach/forward\\_scatter\\_detail.html](http://www.nasa.gov/offices/meo/outreach/forward_scatter_detail.html)

**biamonte07:** How many will you be able to see at once tonight? I've seen pictures where the whole sky is light up by meteors?

**Bill:** That only happens during a meteor storm, Tonight you should be able to see more than 1 per minute if the sky is clear.

**JP\_in\_SH:** Bill, thanks for hosting this chat, very enjoyable and informative. This might be a dumb question but, I'm watching USTREAM. What exactly am I looking at? What area of the sky? How much of an area? Thanks.

**Bill:** The Ustream feed is from a low light level tv camera with a fisheye lens pointed straight up - you are seeing the entire sky.

**marc\_1:** hello from Washington. What is the source of the shower and does it have anything to do with that big meteor that is heading our way

**Bill:** Perseids come from Comet Swift-Tuttle. Has nothing to do with the asteroid projected to pass close to Earth.

**leigh:** Where to look? Straight up or to the West/North West? In Ohio, which direction is the Big Dipper? (That's the only thing I recognize up there.)

**Bill:** Look straight up. Be sure you are outside long enough for your eyes to dark adapt (45 minutes or so).

**Design:** What are most meteors made of? You say they can impact the moon does this happen often and does it leave behind whatever its made of?

**Bill:** Most meteors are an ice dust mixture. We observe softball size meteors hitting the Moon every 2 to 3 hours. And yes, the meteor leaves bits of itself on the lunar surface.

**DestinationDawn:** What effect can leftover meteor dust remaining in the atmosphere for several months cause?

**Bill:** I don't think it has any effect.

**FNR.SPFC.633:** Hi, what's the best (HQ) to watch or wait for it in the internet??

**Bill:** You can go to [spaceweather.com/video](http://spaceweather.com/video) to see nice videos updated every 2 minutes. Best is to go outside for a couple of hours and look at the real thing.

**Joes:** can you give us tips on the best way to view

**Bill:** Find a dark place with clear skies. Look straight up in the sky. Best peak will be 3-4 a.m. local time, about 80 per hour.

**DeepakChopra:** what's the best direction to be looking?

**Bill:** Straight up.

**uncas:** Dr. Cooke, you are so cool. Thanks for all you are doing tonight.

**Bill:** I appreciate the cool questions! : )

**Bazba:** when do they really start falling?

**Bill:** The peak will be 3-4 a.m. local time.

**sarabee:** NASA is working on a weather control device? OMG I MUST BLOG THIS!

**Bill:** \*smile\* Said tongue-in-cheek, sara!

**minnesotastar:** The Perseid Shower sounds beautiful... What else makes sounds in outer space? (By the way, it's cloudy here : (

**Bill:** Other meteor showers, too. Sorry about the clouds -- maybe tomorrow night you can try again. : )

**MissDee:** I am in new jersey and the sky's are so very uncooperative...will I be able to view more some other night or is it done after tonight?....I will be so heartbroken if I don't get to see it for myself...

**Bill:** You can try again for the next few nights, but the rates will be decreasing. On Friday night, about half of what it is tonight. And try our video streams as a surrogate. : ) One is embedded above, also try [www.spaceweather.com/video](http://www.spaceweather.com/video) . Good luck!

**Imeteor:** Do you type each and every response? Or do you have one of those voice converting things?

**Bill:** We type every response. We do it the old-fashioned way. : )

**Imeteor:** Bill, Its almost peak time!

**Bill:** Yes, getting close!

**Blue\_Fire:** Are you overwhelmed with questions? I've asked three so far, but not received an answer. Just wondering.

**Bill:** Hi Blue. Oh yes! The question queue is rocking tonight, so it's not that we're trying to ignore anyone. We love the questions. Keep them coming!

**bessey2010:** can you explain to me what a "hot pixel" is?

**Bill:** It's a bad point on the CCD chip of the camera, shows as always on as a white dot.

**DoctorWho\_Ellie:** Doesn't NASA have some clearance into convincing electric companies to shutting off the outside street lights? I'm in a small town, but I only really saw a tiny one. I have to go behind a house or so to really see them anymore.

**Bill:** We have no influence over your local utilities. : ) Keep trying!

**Bazba:** I SAW ONE!!!

**Bill:** Awesome, Baz!

**pswasko:** back to the difference between meteors and fireballs. It sounds like you said that fireballs are larger meteors and therefore make for a brighter display? On average, if you see 80 meteors an hour, how many might be fireballs.

**Bill:** It really can't be predicted in advance.

**Bill posts to the room:** Hi -- we have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

Remember, dark clear skies away from city lights, look straight up overhead. Best viewing is after midnight, with peak of projected 80 per hour between 3-4 a.m. local time

**kyler:** why are meteors called meteor? and what's the difference between a meteorite and meteoroid?

**Bill:** A meteoroid is a piece of ice, dust or rock found in space. A meteorite is an extraterrestrial rock found on the ground.

**25retahogg:** have a great night Mr. Cooke I had so much fun learning.

**Bill:** I'm glad -- happy viewing, retahogg!

**Cyberon:** On the USTREAM, could the "hot pixel" you mentioned (that's sitting at about 8:00 on the screen) actually be Jupiter? I was out observing earlier and noted it is far brighter than the stars.

**Bill:** It's not Jupiter because it doesn't move. Jupiter would change position over the course of the night. But you're right, Jupiter is very bright this evening.

**US.MARINE:** Will this be the largest this year?

**Bill:** That will be the Geminids in mid-December (Dec. 14).

**futureastronaut:** What is a Geminid?

**Bill:** It's the meteor shower in mid-December.

**(Moderator Brooke):** *Hi everyone. Welcome to tonight's "Up All Night" web stream and chat for the Perseids Meteor Shower. To submit a question, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for your patience as we answer your questions!*

**Akane:** Where in the sky should I look for the meteor shower?

**Bill:** Look straight up overhead, with clear and dark skies.

**amazwe:** Are there a lot more meteors hitting the atmosphere than we can see with the naked eye, or do they always light up?

**Bill:** Yes, many more. They don't always light up -- some are too small or too slow.

**futureastronaut:** so if I look up will I see the meteors?

**Bill:** Yes, if you have clear, dark skies.

**natface:** when are the next set of meteor showers?

**Bill:** That will be the Orionids in October.

**Kristi:** Wow, they are only 1mm?? How are we able to see such small things so far away?

**Bill:** We see them when they burn in the Earth's atmosphere, and that starts about 72 miles above the Earth. At 130,000 mph, even a 1 mm particle makes quite a light show.

**joe:** where did the water source for the ice that is mixed with the dust originate?

**Bill:** From comets.

**MKaufman:** one website I read said that Perseus is a winter constellation in the northern hemisphere. is this incorrect? It would seem that if it is a winter constellation, then our chances of seeing it now during the summer would be greatly reduced.

**Bill:** Perseus is a winter constellation, meaning visible just after sunset in the winter. However, in the summer, you have to wait until well after sunset for it to become visible.

**B:** I am on Oahu in Hawaii. When will be the best time to see the meteor shower?

**Bill:** try this link:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)



**nattlee:** Since I have no clue about any of this and this is the first meteor shower I have ever made the effort to watch I am trying to learn a few things. The big ones with the red/orange color are fireballs, maybe? Are there more of them during the peak time (3-4 a.m.) than the rest of the time?

**Bill:** The larger ones (several cms across) do produce the fireballs, which are brighter than Venus. And you're exactly right -- 3-4 a.m. local time tonight will be an optimum viewing time.

**US.MARINE:** Bill what's the largest shower ever recorded?

**Bill:** The 1966 Leonids where rate hit as high as 100,00 per hour.

**oceankai:** How many big shower occasion during a year ( such as Perseid for Aug ) ?

**Bill:** Four to five -- depends on your definition of big. : )

**leigh:** How can we see something 1 mm big if it's hundreds of miles away?

**Bill:** We see it when it's burning up in the atmosphere, around 74 miles above the Earth.

**futureastronaut:** I sat outside for 5 minutes and can't see a meteor.

**Bill:** Give it a little while longer. Make sure also that your eyes have 45 minutes to dark adapt.

**angelskifli:** seen a long streak very bright right above me it was amazing have seen 6 in a matter of 20 min I live in California near the mountains.

**Bill:** That's VERY cool. Wish I could have seen it!

**chubs15:** How far from the city should you be in order to see anything?

**Bill:** Far enough to get away from the lights. If you can see all the stars in the Little Dipper, that's probably dark enough.

**zac:** anyone seen any meteors yet?

**Bill:** Zac, we're getting reports of meteor spottings from all over. Try this link, too.

[www.spaceweather.com/video](http://www.spaceweather.com/video)

**itsme:** guys I dunno which way to look!

**Bill:** Straight up overhead.

**DoctorWho\_Ellie:** If I woke up around 4: 30am, would I still be able to see a lot?

**Bill:** No, that would be a little late for viewing.

**Kristi:** Is it possible that the water found on Mars by NASA's Phoenix Mars Lander could possibly be from a source like icy meteors landing on the surface of Mars and not actually from Mars itself?

**Bill:** Icy meteors can't land on the surface of Mars -- they burn up.

**futureastronaut:** I have seen only a quick flash of light. was that a meteor?

**Bill:** Yes, if it was a streak.

**natface:** can I ask what time is it where the cameras are? I am from the UK and I want to work you when roughly 3am is over there so I can check your camera : )

**Bill:** For the camera above, it's 2: 12 a.m. Central Time. For the [www.spaceweather.com/video](http://www.spaceweather.com/video) cam, it's 3: 12 a.m. Central.

**skeber:** will tonight or tomorrow night be more of a show?

**Bill:** Tonight is definitely the peak. You can see about half this rate tomorrow night.

**Bill posts to the room:** Hi -- we have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

Remember, dark clear skies away from city lights, look straight up overhead. Best viewing is after midnight, with peak of projected 80 per hour between 3-4 a.m. local time

**hersh:** Should you expect to see one every several minutes?

**Bill:** Yes, or quicker.

2837131: Bloody h\*ll, I should've stayed longer in Maine! I'm within 30 miles of Manhattan and can't see anything!

**Bill:** You can share our cameras. : )

**himynameisbob:** Hey, bill, I've been sitting here for 2 hours (outside) and haven't seen any activity. What's going on?

**Bill:** It depends on what time it is, and if your sky is clear and dark. Make sure your eyes are dark-adapted. If you're looking at a computer screen, that will have an effect. Stay with it. : )

**joe:** where do comets come from?

**Bill:** Comets like Swift-Tuttle come from the Kuiper Belt. Long period comets like Hale-Bopp come from the Oort Cloud.

**marc\_1:** thank you for answering our questions my hard working friend!

**Bill:** Glad to -- appreciate all the good company for Perseid-watching tonight!

**sweetlaces:** When were meteors first observed scientifically?

**Bill:** Not until the early 1800s. Before that, people thought meteors were vapors in the air.

**angie:** hello, we are in Sacramento, ca. Don't really see anything yet.

**Bill:** be patient. If you have clear, dark skies, it will come!

**cvchdtuetyie:** is it active now in nc?

**Bill:** Yes!

**outofvogue:** Is 3 am edt a good time to view the shower

**Bill:** Anytime just before dawn will be the best time, up to 80 per hour.

**CQuinn:** Good evening and thank you for hosting this. My question is how active should the peak hours be?

**Bill:** Hi CQuinn -- at peak (around 3-4 a.m. local) should be 80 or so per hour.

**joo9o9o9o9:** Should I wear sunglasses if my streetlights are on and are making the street too bright?

**Bill:** I don't think that will help. : )

**futureastronaut:** do you like answering questions like these?

**Bill:** Sure -- fun stuff. : )

**futureastronaut:** how long will this chat last.

**Bill:** we'll be here until 4: 00 CDT. So about another 90 minutes or so.

**hersh:** It's too cloudy in my area : ( Is there anything I can do to be able to see them?

**Bill:** Unfortunately, no. But you can view the embedded camera above or go to [www.spaceweather.com/video](http://www.spaceweather.com/video) to see some live feeds.

**Bazba:** I am in central timezone. What's the best time to be watching the meteor shower (in central time zone language please)

**Bill:** 3-4 a.m. Central Time. : )

**sajeffe:** Do you have a 250 person max for the chat? (It was hard getting in.)

**Bill:** Yes, we do. Maybe with the success of this chat, we can get that bumped up for the next one. : )

**simmywade:** How many nights does this go on?

**Bill:** Until Aug. 24 -- but you won't see many beyond this weekend.

**Bridog711:** How many meteors will you be able to see at time?

**Bill:** It varies based on night and time. 3-4 a.m. local time tonight will be the best peak at about 80 per hour.

**futureastronaut:** how long will this meteor shower last. I WILL MAKE MY FREINDS JEALOUS!!!!!!

**Bill:** Hahahaha! Through Aug. 24, but there will not many to see after this weekend. Tonight is best, about half this rate tomorrow (Friday) night.

**chandu:** Is peak time 3-4AM in California as well?

**Bill:** it is. 3-4 a.m. local time in California.

**himynameisbob:** Someday, would it be possible to mine metals and other materials off of meteors like Perseid?

**Bill:** Not from the ice. : )

**minneapolismetmegirl:** Help! Severe thunderstorms in the Twin Cities this evening.....aghhhhhhhhhhh! Clouds are so heavy; A star is NO WHERE in site. Lot's & Lot's of Beautiful lighting..BUT.....Am I going to miss this??? I'm 32 & this was the first time I ever even heard of such an event.

**Bill:** Glad to have you here for your first Perseids. : ) Tomorrow night you can see about half the rate of tonight. It's worth a shot!

**angie:** how often do these showers occur?

**Bill:** The Perseids occur each August. Overall, there are about 30 meteor showers per year each year.

**himynameisbob:** How does the sound from the meteorites work?

**Bill:** If you mean the live feed, the meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**skeber:** Are we expecting to see more tonight or tomorrow night?

**Bill:** More tonight -- this is the peak!

**hersh:** I still haven't seen even a single meteor on your live video feed! is the whole thing a hoax???

**Bill:** No hoax. We've seen some on the camera, but there's also some haze. You can hear them passing in the audio. Or try [www.spaceweather.com/video](http://www.spaceweather.com/video)

**010100010:** at what temperature are the meteoroids when burning up, and at what speed?

**Bill:** They move at 130,000 mph. On the temperature, between 2,000-6,000 degrees Kelvin. In other words, scorching!

**futureastronaut:** how long does it take to answer a question?

**Bill:** Not too long, but it take awhile to work through them. : )

**FNR.SPFC.633:** There's only one big bright thing up here in Sao Paulo, is that Jupiter?

**Bill:** Yes, it is.

**ab2tract:** the blinking lights on the edge of the screen...cell phone towers?

**Bill:** No, building and parking lot lights.

**sweetlaces:** When is the next meteor shower going to be?

**Bill:** The Orionids in October.

**kmwells:** My 10 year old son stayed up to just see this event...

**Bill:** That's awesome. : )

**nattlee:** I have asked several questions about the streak I saw earlier in the sky that was reddish/orange but the rest have been white. What is the difference?

**Bill:** Mostly that's eye perception, but also has to do with the atoms in the atmosphere that are ionized.

**itsme:** What time is peak time? EST?

**Bill:** 3-4 a.m. at ANY local time.

sonya: my brother saw one , I missed it : (

**Bill:** : (

**campout:** I'm sitting here weighing my options... there's a small observatory here in town that sometimes does special events for nights like this, or I could drive outside pretty easily to a dark area. Any advantage to an observatory setup for an event like this, or does it really need to be viewed full-sky?

**Bill:** You need the dark sky over the observatory. The telescopes won't help as much.

**ssicinsc:** The meteors are so fast! Why are they so fast? Is it because our planet is traveling fast through space or because they are traveling fast at us?

**Bill:** They travel so fast because they're in orbit around the sun.

**ssicinsc:** How many questions are there in the queue?

**Bill:** We've had close to 3,500 so far.

**DaGreenDino:** Can you see anything where you are, Mr. Cooke?

**Bill:** We are -- had some nice fireballs in the area this evening.

**Big\_Nate:** I saw one earlier that was orange and lasted a good 8 seconds. Why have all the others been green and white and only last a second or 2?

**Bill:** It's largely about eye perception and the atoms being ionized in the atmosphere.

**Michael:** Which yearly shower consistently shows the most meteors, or do they vary by the year?

**Bill:** The Geminids in mid-December is consistently the best.

**Ganik:** are the meteors going to be visible over Oregon?

**Bill:** Yes, 3-4 a.m. local time.

**haleigh:** What's the fastest they'll be going, and at what time?

**Bill:** 130,000 mph, all the time. : )

**Jack:** Is part of the reason you say to look straight up is that there is more light toward the horizon, so less light straight up?

**Bill:** No, it's because you don't look toward the radiant.

**TracyDi:** Just saw 4 in the past 15 minutes here in Southfield, Michigan. It's absolutely breathtaking. Wish I could stay up and keep watching!

**Bill:** Good -- glad you got to see some of the show. : )

**striker:** hey guys is the meteor shower over?

**Bill:** No, still happening through Aug. 24. After this weekend, there's not much left to see. Tonight the peak is right before dawn. Tomorrow night will be half of what will be seen tonight.

**sebastian:** It's beautiful!

**Bill:** Yes, it is!

**futureastronaut:** do all comets leave meteor showers?

**Bill:** All comets leave meteoroids behind in their orbit. Meteor showers only occur if the Earth passes near the debris.

**km213:** I'm in central Florida....clear skies and see nothing

**Bill:** Make sure you also have dark skies, and that your eyes are dark adapted for about 45 minutes before viewing.

***(Moderator Brooke):** Thanks for your questions - keep them coming! To submit a question, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for joining our chat!*

**sara\_847:** How much would we be able to see tomorrow night?

**Bill:** About half of the viewing rate tonight.

**Bill posts to the room:** Hi -- we have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

Remember, dark clear skies away from city lights, look straight up overhead. Best viewing is after midnight, with peak of projected 80 per hour between 3-4 a.m. local time.

**mirandamjoarygnaen:** is it active right now in Washington state?

**Bill:** Yes, active very soon with your peak at 3-4 a.m. local time.

**hhh:** it's been mentioned that we can "hear" the meteors. Does this mean with our ear or with scientific instruments?

**Bill:** Not with your ears. When you listen to the live audio feed, you hear the meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**brian:** One of the few I saw did not have a linear path all the way. It seemed to deviate a couple of degrees before it disappeared. Was it just breaking up?

**Bill:** Possibly -- without seeing it, it's hard to tell.

**k.james:** I am in Charleston, sc. and in the past hour and a half I have seen about 50 meteors, 2 giant ones with tails, about the length of my hand when held up to the sky...

**Bill:** Cool -- congratulations. Impressive show.

**futureastronaut:** in between 3-4 will the meteors be EXTREMELY active?

**Bill:** Yes, at rates of 80 per hour.

**Robin:** Do meteor showers go best with a glass of wine? : )

**Bill:** Not if you want to stay awake. : )

**liz:** Does this shower happen every year?

**Bill:** Yes, every year in August.

**striker:** why can't I see anything in Los Angeles California?

**Bill:** You may have cloud cover, or you may have too many city lights.

**kyler:** what is the expected rate per hour of the Orionids and Geminids

**Bill:** Orionids 30 per hour, Geminids over 120 per hour.

**john:** will there be more meteor showers tomorrow(Friday night)

**Bill:** Yes, about half of tonight's rate -- maybe 30/hour.

**jordan:** which compass direction will the Perseids come from?

**Bill:** In the U.S., the northeast.

**sara\_847:** Are the peak hours the same then for tomorrow night?

**Bill:** Yes, just before dawn (3-4 a.m. local time).

**Rex:** According to CBS news today, NASA scientists said at least 80 meteors an hour will be visible during the peak. Is this report accurate? Who were the scientists that said that? Is anyone even getting half that?

**Bill:** The scientist was me, and the International Meteor Organization is reporting 82 per hour in Europe. : )

**tehehe:** can you see this in Winnipeg

**Bill:** Yes, over all of Canada.

**Ganik:** Roughly how big are the meteors ? How close are they to Earth?

**Bill:** 1 mm to several cms. They burn up in the Earth's atmosphere.

**karo:** How do I get an awesome job at NASA like yours?

**Bill:** Get an advanced degree in physics and astronomy. : )

**larryd:** I'm in central Washington state, where do I look to best see them?

**Bill:** Straight up overhead, away from city lights and need clear skies.

**Space12345:** how many are being spotted per hour right now?



**Bill:** The IMO is reporting 82 per hour in Europe, as of right now.

**Hilda\_Torres:** I have to work tomorrow lol

**Bill:** But think of the stories you'll have. : )

**liz:** Is this the biggest shower of the yr? When will the next shower be? And will you be doing a live chat then? Thanks for your time Bill & Crew!

**Bill:** Geminids will be the biggest shower in mid-December. The next will be Orionids in October. You're very welcome on the chat -- we'll see how it goes for Geminids. : )

**Rex:** Which NASA scientists told the press there would be 80 an hour during the peak tonight?

**Bill:** That was me. : )

**DaGreenDino:** What is ionizing?

**Bill:** It's ripping the electrons off of an atom.

**sajeffe:** Well, I tried. The clouds moved out nicely but street lights are problematic. And my neck hurts from looking up. Dang it! Thanks for the chat, Dr. Cooke. Nice job!

**Bill:** You're welcome. Sorry about your neck. Maybe try again tomorrow?

**KF:** How late is this supposed to be going on?

**Bill:** The meteor shower will happen until dawn. For us, we'll be here until 4 a.m. CDT. Lot of night owls in here!

**neli:** which direction should we look if we live in Fairfax Virginia?

**Bill:** Look straight up at the sky between 3-4 a.m. Nice dark, clear skies!

**jaydubya51:** Will there be a transcript available of tonight's questions/answers for later reading?

**Bill:** Yes, early next week we'll get that posted.

**futureastronaut:** I'm enjoying this! Is this voluntary If so AWESOME!!

**Bill:** It is! And I'm enjoying it, too. It's nice to have the company.

**schmittty:** How many cups of coffee have you guys gone through?

**Bill:** Not a single cup yet! Too busy. ☺

**spaceboi:** What's that static sound in your live webcam?

**Bill:** It's like radio static, and you hear chirps and whistles when a meteor reflects a distant TV signal to the HAM receiver.

**Jack:** When you say "eye perception", could you be more specific? Chromatic aberration, etc.?

**Bill:** Color perceptions. When objects are faint like stars or meteors, your eyes may "assign" a color that isn't really accurate. This only happens for faint objects, and it's just the way the human eye is designed.  
[http://en.wikipedia.org/wiki/Rods\\_and\\_cones](http://en.wikipedia.org/wiki/Rods_and_cones)

DevinT: Almost 3=)

**Bill:** getting close!

Kerdex: It's cloudy over New York, will anything be visible?

**Bill:** Unfortunately, probably not.

jailer: what is local time for you

**Bill:** 2: 55 a.m.

loveofspace: I'm in Seattle and the sky is clear with many stars visible yet I see no meteors?

**Bill:** Make sure your eyes have about 45 minutes to "dark adapt."

sleepyman: Do you get a lot of funny questions?

**Bill:** Only when it gets late. Like now. : )

Draggie: Do I need to look in any certain direction to see the meteors?

**Bill:** Best to look straight up toward the zenith of the sky.

futureastronaut: are there meteor showers in November?

**Bill:** Yes, the Leonids and the Taurus.

snail: Will they be visible in Canada ? Specifically Manitoba? D:

**Bill:** They will. : ) 3-4 a.m. local time for the peak.

futureastronaut: what is the radiant of a meteor? if you look directly at it will you go blind?

**Bill:** The radiant is the constellation from which the meteors appear to "radiate." In this case, constellation Perseus.

psyched: I saw 4 around 2: 30 in Orlando Florida. amazing.

**Bill:** Very cool. : )

**(Moderator Brooke):** We're working to get through all of the great questions you've asked us. Keep them coming! To submit your own question, please type it in the box at the bottom of the window and click the "Ask" button on the right side of the box. Thanks for your patience as we answer your questions.

**nalinda:** I saw 3 (two orange and one red) between 3.05 and 3.20am. I'm in Cleveland OH.

**Bill:** A colorful show over Ohio then. : )

**ben:** Saw about 3-5 in total while out there, it's a breath taking thing

**Bill:** Ben, thanks for sharing. That's awesome.

**Jude:** yee haw!! just say 19 in the past 45 min. in Asheville, NC. this is awesome!

**Bill:** Oh wow -- you're getting a huge light show!

**neli:** When is it active in Virginia?

**Bill:** best show is happening right now in the eastern time zone. (just before dawn)

**sleepyman:** Are the planes or astronauts in danger?

**Bill:** No, no danger from the Perseids.

**asell6789:** It's storming in Minnesota tonight, but I can still see some meteors tomorrow night?

**Bill:** Yes, but only about half the rate from tonight. Maybe 30 per hour.

**neli:** I've been awake for a long time now.. There are clouds but there not too bad you could see through them. Are the meteors strong enough to see through the clouds?

**Bill:** Only if they're very bright -- but it does happen.

**DevinT:** Bout To Go outside To Get Eyes Ready=))

**Bill:** Happy dark adapting, Devin. : )

**skylar:** it's great that so many people are observing

**Bill:** Yes, it is. Fun stuff!

**chels04:** are fireballs common?

**Bill:** In the Perseids shower, yes.

**Chef:** Please answer this one - I'm in England, will I get to see 40/hour at around 3am gmt time?

**Bill:** Yes, you will.

**dayday5774:** why cant I see any in Ohio? I live in the country too

**Bill:** Make sure you have clear skies. Look straight overhead. Allow your eyes enough time to get used to the dark.

**tehehe:** are the meteors visible in Winnipeg, mb?

**Bill:** They are

**asell6789:** what would be the peak time to watch meteors tomorrow night if we are unable to see them tonight?

**Bill:** Still 3-4 a.m. local time.

**celestron:** I've seen 3 and I'm in the middle of the city

**Bill:** You're lucky, and you have sharp eyes. : )

**shae:** I'm seeing about 20 per hour in Utah.

**Bill:** Excellent!

**DevinT:** Can you see it if you live in the city

**Bill:** No -- go somewhere where the sky is dark.

**Joanne:** Daytona Beach, on a blanket.....great show....

**Bill:** That sounds like a great way to view them!

**marios:** I can't see much in my local sky, so I turned to your live feed and I don't know what to look for its all static black

**Bill:** Go to this link -- it will help you know what to look for, namely streaks of light:  
[www.spaceweather.com/video](http://www.spaceweather.com/video)

**shae:** I'd like to see many at once, is this possible around the 3-4am time?

**Bill:** Yes, that will be the best peak for this shower.

**haleigh:** how come the peak is 3 am local time? why isn't it the same everywhere?

**Bill:** That's because you want the radiant as high as possible to get the maximum number of meteors for a shower that last days, like the Perseids. If a meteor storm, it would be one time, and only part of the Earth could see it.

**DevinT:** Can you see it if you live in the city??? I'm 13 and this is my first meteor shower and I really wanna see something

**Bill:** Hi Devin. You really need a dark place to see it well. You can share our cameras if you don't have any luck. [www.spaceweather.com/video](http://www.spaceweather.com/video)

**chels04:** Have there been any fireballs tonight?

**Bill:** Yes!

**bobby:** why can't I see anything?? the skies seem clear...how bright are the meteors??

**Bill:** As bright or brighter than the North Star for regular meteors -- fireballs are as bright or brighter than Venus.

**Chef:** Before they hit our atmosphere how large are the biggest?

**Bill:** 1 mm to several cms across.

**maali:** In the UK I missed do I still have an opportunity to see it tonight?

**Bill:** Yes, best view from 3-4 a.m. local

**Bill posts to the room:** Hi -- we have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

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**chels04:** I'm in Northeast Tennessee, where do I look to get the best view?

**Bill:** Look straight up at the zenith of the sky.

**maribel60:** I saw two, already, so far

**Bill:** Awesome.

**briant:** are they visible in Calgary Alberta?

**Bill:** Yes, all over Canada

**neli:** Virginia? When? Where? Thanks : D

**Bill:** 3-4 a.m. local time. : )

**chels04:** This is absolutely amazing!

**Bill:** It's quite a show, isn't it?

**Draggie:** I can see the stars when I look straight up, is that clear enough? What do you consider a clear dark sky? (Silly I know)

**Bill:** If you can see all the stars in the Little Dipper, you should be in good shape.

[http://en.wikipedia.org/wiki/Little\\_Dipper](http://en.wikipedia.org/wiki/Little_Dipper)

**nida.a786:** are you watching from an observatory?

**Bill:** No, from Marshall Space Flight Center in Huntsville, Alabama.

**liz:** Good night and thank you from Olympia, WA! : )

**Bill:** Thanks for being here, liz!

**dollydollyvu:** it's too rainy and cloudy in Minneapolis : (

**Bill:** Maybe try again tomorrow? Weather permitting, of course.

**bill\_carp:** Are most of the meteors too dim to be seen in the suburbs?

**Bill:** It's mainly that the cities have too much light. It's best to get away from the city lights, if you can.

**Guest:** Eastern Ohio..saw 7 in an hour..not bad for in the city . Thanks a million Bill!

**Bill:** More from Ohio -- that's a great city view. Thanks for the report! : )

**Draggie:** I haven't heard anything from the live feed, has there been much activity on there?

**Bill:** We have seen Perseids, and the audio feed has been very active.

**Jack:** Bill, just for the sake of folks who haven't really seen the sky before, I saw the Perseids about 15 some odd years ago, up in the mountains, away from lights, west of Boulder, CO. It was a mile high plus.

**Bill:** That would be an amazing view.

**RebeccaL:** I think I'm off to bed.... Thanks for answering all the questions Mr. Cooke, I think you may have inspired me to actually pay attention in science class... Astronomy really is amazing, it seems like it'd be an amazing experience to work with NASA and to be a part of a team where there are people like you. Good night, and best of luck!

**Bill:** Thank you for being here, Rebecca. I'm glad you enjoyed it. : )

**j:** I saw a few already just after 10pm here in the NW. I went back outside after midnight and saw more.

**Bill:** Good deal!

**sebastian:** Thanks so much for sharing this experience with me and everyone else Bill!

**Bill:** It's been a pleasure, sebastian.

**mistychristie:** How is the view where you are located Bill?

**Bill:** Slightly cloudy, but we're seeing bright meteors.

**marean:** hello and thank you so very much : )" Have you had any reports from WASHINGTON STATE ? if not when may we expect them ?

**Bill:** We are hearing that meteors are showing up over the Washington skies!

**kmwells:** Are they more visible in different regions of the United States? Because we saw only One at around 3: 20am and no more after that...

**Bill:** No regional differences -- the weather and city lights will be a factor from place to place.

**kmp:** bill are you sitting outdoors with a laptop...are all of us?

**Bill:** No, I'm observing via cameras here at Marshall.

**(Moderator Brooke):** *To submit a question, please type it in the box at the bottom of the window and click "Ask" button on the right side of the box. Thanks for your patience as we answer your questions.*

**Dave5317:** ft Lauderdale here....just saw a nice greenish meteor with a smoke tail!! Nothing for 15mins then a nice surprise!

**Bill:** Sounds like a beauty!

**Guest9998:** Where can I see photos??? live in the middle of LA, should have taken Friday off and drove to the desert. Cannot see any here, too much light.

**Bill:** We'll try to get some posted on the NASA Meteor page at [www.nasa.gov/meteor](http://www.nasa.gov/meteor)

**mirandamjoarygnaen:** is the image in the video a flat image made into a circle?

**Bill:** It's achieved through a fish-eye lens.

**lum:** which direction should I look from California?

**Bill:** Look straight up to the zenith of the sky

**Bill posts to the room:** We have a lot of people coming and going in the chat, so re-sending this link. It will give you good advice about viewing the Perseids in your area:

[http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post\\_1281666326749.html](http://blogs.nasa.gov/cm/blog/Watch%20the%20Skies/posts/post_1281666326749.html)

Remember, dark clear skies away from city lights, look straight up overhead. Best viewing is after midnight, with peak of projected 80 per hour between 3-4 a.m. local time.

**Jack:** Bill, (hit return to fast), plus, I actually saw the Milky Way, which was only before known to me through books. It actually can be seen!

**Bill:** Yes, it can. Beautiful, isn't it?

**gman\_1:** The, ping, whistling and humming in the Ustream feed... Is that artificially created or is it some effect from the ionizing meteors ??

**Bill:** The meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**DaGreenDino:** Did the moon used to be a meteor/meteorite?

**Bill:** No, moon used to be part of Earth.

**briant:** hey, I've been outside for a very long time, and I have seen anything, am I looking the wrong way?

**Bill:** Look directly overhead. Are your skies clear and dark?

**kyler:** what is the expected rate of the Leonids and Taurids

**Bill:** Both about the same at 20 per hour

**ShootingStarzz:** why do our eyes need to adapt to the dark?

**Bill:** Because in order to see faint object, you pupils need to get wider. It takes some time for this to happen, and it takes some time before they'll start to dilate.

**Draggie:** EEEE! I just saw my first one!

**Bill:** Congratulations!

**gonephone:** Hello, Dr. Cooke. Should we hear the sound after seeing it on the live cam?

**Bill:** Not necessarily -- they're not synched.

**ben:** Hi Bill, thank you for this! this chat is awesome

**Bill:** Glad you're enjoying it. : )

**kmp:** will it get dark enough in Alaska or should I just go to bed

**Bill:** If you can see the Little Dipper, it's dark enough. [http://en.wikipedia.org/wiki/Little\\_Dipper](http://en.wikipedia.org/wiki/Little_Dipper)

**Mrs\_Bear:** I saw 1, here in N. CA., but I had to give up, neck didn't cooperate. : )



**Bill:** But I'm sure that one was a beauty!

**aaronmfcurtis:** which direction in the sky do I look in California?

**Bill:** Look straight up. Some advice has been to look northeast toward Perseus -- but you shouldn't look directly at the radiant. Overhead is the best viewing.

**Guest:** How can something so small give off such a bright light?

**Bill:** Anything hitting the atmosphere at 130,000 mph heats to between 2,000 to 6,000 Kelvin -- that shines pretty bright!

**DevinT:** If my eyes didn't adjust will I still see them?

**Bill:** yes, but very few.

**joe:** what is the white static "fuzz" that looks like it is moving around the edges of the live stream?

**Bill:** Those are parking lot lights and building lights.

**Space12345:** what is the difference between a fireball and a meteor?

**Bill:** Fireball is meteor brighter than planet Venus.

**WiL:** When will I see any activities in San Francisco, ca?

**Bill:** 3-4 a.m. local time.

**stephanie:** Bill I guess I'm just lucky, I went outside for about 10 - 15 mins and I saw 3-4 just in that time span. And this was at about 3: 55 I went out. And I'm in northern Florida, so that's the update for those that I saw were in FL asking questions. Just wanted to say that was awesome!!

**Bill:** Wow, what a show!

**bob:** seeing plenty in San Diego tonight...

**Bill:** Hello San Diego!

**Kryshawk:** I was viewing the sky in the Desert in Southern California with my mom. Is the comet the brightest thing in the sky tonight?

**Bill:** There's no comet in the sky tonight. The brightest thing is the planet Jupiter.

**briant:** can you see any in Calgary Alberta, and if you can, what is the best time?

**Bill:** Yes, 3-4 a.m. local time.

**chels04:** Can you see them again around midnight tomorrow?

**Bill:** Yes, best viewing at 3-4 a.m. Not as many as tonight, about half the rate of tonight.

**simmywade:** So this is the peak time for everyone right?

**Bill:** Yes - 3-4 a.m. local time for everyone.

**david:** I was just outside for an hour from 3-4 in Ohio and I saw about 40 of them maybe more...very spectacular show. Was lucky enough to even see a fireball right above me!!

**Bill:** Now that really is lucky! Thanks for the report, david.

**Solace015:** Thanks for doing this for us all...I don't wanna wait for my question to be answered cuz I'm missing the show but did want to say thanks.

**Bill:** You're very welcome.

**aaronmfcurtis:** Just saw a beautiful purple one in Highland, California. Lit up the whole sky!

**Bill:** Great! Lucky Highland.

**rich:** its past 4 am here can I still see it?

**Bill:** As long as the sky is dark and you can still see the stars in the Little Dipper.

**mdorin:** Where is the worst place to view these?

**Bill:** In the middle of New York City or Las Vegas.

**DevinT:** hahah !saw one sooo cool worth it

**Bill:** Yay!

**frank2010:** will we see more fireballs?!

**Bill:** As long as the shower is happening, then yes, you can see fireballs.

**BobKCO:** Hi, Bill. Thanks for the welcome and the link. It took my eyes about 10 - 15 minutes to adjust to the low light level, then they started poppin' ... 3 - 4 in 10 minutes. Awesome show, enjoy!

**Bill:** Great! The dark adaption is very critical to meteor viewing.

**schmitt:** How can you tell if it's a "fireball" or not?

**Bill:** A fireball is brighter than the planet Venus.

**j:** so will we be seeing more here in Tacoma, WA around 3am??? still waiting for the reply : (

**Bill:** Yes, that will be the peak from 3-4 a.m. local time. Enjoy!

**j:** thank you, thank you. I just want to make sure so my son will not get disappointed waking him up as early as 3am and yet he missed all the show. thank you again : )

**Bill:** My pleasure. Sorry for the delay, just tons of questions tonight. Thanks for your patience. : )

**joe:** do the meteors look the same from space looking at earth as they do from earth looking to space?

**Bill:** yes, they look the same.

**Imeteor:** visible after 4am?

**Bill:** As long as it's dark enough to see the stars in the Little Dipper.

**jbessey2010:** are meteor storms able to be predicted and if so when's the next one?

**Bill:** yes, they can be predicted. Off the bat, I don't know when the next one is predicted -- not for a few years, anyway.

**vkngfan10:** When is the peak in Plano, Texas..a suburb about 25 miles north east of Dallas?

**Bill:** 3-4 a.m. local time

**wasntme:** Thank you Dr. Cooke it was a blast with your chat and saw a lot. My daughter Kim learned a lot . Had to call it a night due to a skunk – whew, it was a close one! Have a great rest of the day.

**Bill:** Hahah! Those skunks! Thanks for being here.

**Space12345:** How can you tell when you've seen a fireball?

**Bill:** It will be brighter than Venus.

**maribel60:** Arizona yes or no?

**Bill:** Yes. : )

**space\_junkie:** I think the predictions were off. My husband and I went out around 3am and just came in now after 4 am and we only saw approx 30 to 35 in NC. Are the stat's your receiving confirm this?

**Bill:** The International Meteor Organization is still reporting 82 meteors per hour. But I'm happy you got to see those 30- 35. Good show!

**kalvir:** Vancouver time? thanks

**Bill:** 3-4 a.m. local

**jrnig:** I see all the stars in the little dipper

**Bill:** Then you have a good sky for meteor watching!

**jrnig:** Bill how much did you see?

**Bill:** Not much in this conference room. : )

**kyler:** yesssss lots of meteors in Everett WA.

**Bill:** Great!

**mechanical\_engineer:** Got a lot of good looks and caught one in a photograph! Thanks for enlightening us on the subject, Dr. Cooke. I hope to join you and at MSFC as a NASA Engineer in a couple of years!

**Bill:** Looking forward to it. Bring that photo. : )

**DownwHarmony:** Hi Bill! I think this is awesome that you're doing this! ;) I am outside with my laptop and taking breaks for to watch. Take a few for the light adjustment!

**Bill:** Good idea -- the dark adapting is critical to your meteor watching.

**Akane:** Seattle here, saw 4 so far!

**Bill:** Way to go, Seattle!

**chels04:** Are you getting good reports above Tennessee?

**Bill:** Yes, sounds like Tennessee had a good night of watching.

**jmbohannon:** wow my 13 year old saw one with a long tail it had like a fireball how come some are longer than others

**Bill:** The ones with longer trails are generally bigger and hence are brighter.

**buckchoc:** I'm in Denver I just saw a few

**Bill:** Great!

**spaceman123:** I AM UP LATE TO VIEW THE SHOWER....WHAT TIME SHOULD I GO OUT ARIZONA..

**Bill:** 3-4 a.m. local time

**Kryshawk:** what is a Leonid and what is a Toured?

**Bill:** Those are two meteor showers. Both occur in November.

**chels04:** Is the milky way that big bright star I see straight up, or a planet?

**Bill:** That's the planet Jupiter.

**thetodd14:** Just saw a handful here in the last 10 min at NWS Tampa Bay

**Bill:** Nice!

charisse: I saw more meteors tonight than I have my entire life!

**Bill:** Cool -- you had a great night then. : )

sleepyman: If these meteors are only mm to cm how come we can see them from so far?

**Bill:** Because they burn up very brightly in the atmosphere.

Eugene: Why do they seem to radiate from Perseus? (according to the website, not that I would have spotted that)

**Bill:** Because the meteors are striking Earth from the same direction -- in Perseus, all the meteors will appear to come from that way.

bobby: I saw a huge stream of light, is that a meteor or is that a fireball ? thnx : )

**Bill:** If very bright, it was a fireball.

Julius: will I see it in Lithuania ?

21 **Bill:** Yes

**DownwHarmony:** What is the difference between an asteroid and comet? If any. And where is the sound being recorded? On earth or in Space. Also I watched a video a while back the stated Jupiter produces a b note in space, is that true. Awesome stuff and I have seen MANY tonight. Last night I seen only one and it was BRILLANT! thank you and take care!

**Bill:** Asteroids are rocky and comets are icy. Glad you've seen all of these meteors!

art: so I still gotta wait for the best part since I'm in Seattle?

**Bill:** Yes, 3-4 a.m. local. Not too much longer!

sebastian: There is an amazing show here in NC right now! Seen 2 fireballs and countless meteors

**Bill:** Lucky you! Excellent.

simmywade: LOL I am in Las Vegas.

**Bill:** Sorry -- might not be great meteor watching. : )

**Jack:** Thanks very much Dr. Cooke ! And, I think it's a privilege for everyone here to have your attention and interest for such an extended period of time ! Thanks! Over and Out ! : )

**Bill:** You're very welcome, Jack. Thank you for the great questions!

**loganlapierre:** Where can we hear the meteors at?

**Bill:** At the embedded stream above this chat window.

**DownwHarmony:** Just want to tell you that I am SO HAPPY that you are doing this! Thank you SO MUCH!

**Bill:** I'm so glad you've enjoyed it!

**jayinv:** Awesome show here in Vermont

**Bill:** Hello Vermont -- that's great news. : )

**bob:** do the fire balls look the same just bigger and brighter?

**Bill:** Yes, brighter than Venus.

**Lithuanian:** is only be seen in United States or in Europe Too ?

**Bill:** Both U.S. and Europe can see the Perseids.

**cjbarrie:** Georgia??

**Bill:** Some good views over Georgia tonight.

**wmpm7:** is it going on in Venezuela?

**Bill:** Yes

**Lithuanian:** Lithuania time? please

**Bill:** 3-4 a.m. local time

**armywifeinillinois:** I am bummed...I live in southern Illinois and have been outside for about an hour and only saw two..but then again it was foggy and I only had one part of the sky to look at.....Is this the best time to view?

**Bill:** Yes, 3-4 a.m. local. The obscuring in the sky will hinder meteor watching. You can try again tomorrow night and hope for better weather -- rates will be about half that of tonight, with best peak still 3-4 a.m. local.

**wasntme:** are you going to be having chats for the showers in the coming months?

**Bill:** We'll see how the planning for those goes. : )

**cocap:** I just saw the biggest one I have ever seen. I have been watching them for years. It is something my whole family enjoyed. Thank you for being here tonight even our children are reading and learning a lot.

**Bill:** That's awesome that you all got to share the experience. Very happy to have you here tonight.

**a3slc:** Bill I am sorry you are stuck in the conference room. Please feel free to go outside. Thanks for helping me find them. Still again what am I to look for?

**Bill:** It's okay. : ) Go to this link: [www.spaceweather.com/video](http://www.spaceweather.com/video) That will help you identify what to look for – basically streaks in the sky. Look up and directly overhead, away from city lights in a clear sky.

**Bridog711:** I saw 4 in like 2 mins! and my friend saw 6 in like 10 : )

**Bill:** Great results!

**loganlapierre:** How are the reports for Washington?

**Bill:** Very good so far, from what the folks here in the chat are saying.

**un1k3n:** What are the odds (based on past) of Perseid meteorites hitting earth?

**Bill:** Zero. They can't survive the atmosphere.

**nickvargas111:** So is the peak start at 3 for every location or only certain parts of the world

**Bill:** It's always local time.

**tori:** SW FL: Saw a BIG fireball and bunch of smaller ones... till the clouds moved in! Thanks for a great night!!!

**Bill:** Sounds like it was quite a night!

**Lithuanian:** Will the meteor shower be seen in Lithuania night ? please

**Bill:** Yes

**mel:** We just came in from watching the shower...we were lucky & saw 3!

**Bill:** That's great, mel!

**njmahill:** Hey Bill, just wanted to say that I do appreciate everything you're doing here. Also appreciate your slideshow on space debris -- eye opening. Anyway, nice little show here in Denver and just wanted to say thanks again

**Bill:** I appreciate that. You're very welcome. Hope Denver continues to get a good show!

**nickvargas111:** Does it start at 3 everywhere?

**Bill:** Yes

**vkngfan10:** is the Leonids shower in November another good one to watch?

**Bill:** Not so much this year. Orionids and Geminids are better.

**Lithuanian:** Why the meteors don't hit the earth ?

**Bill:** Because they burn up in the atmosphere.

**Karen:** Starting to see quite a few in the high desert of So Calif now, even tho it's a lot earlier than peak. Lovely night, milky way is out, Jupiter is awesome, and the airplanes are finally out of sight. Thank you so much for your time and expertise in handling all the questions. I should have studied more science than accounting : )

**Bill:** That's great -- we have other reports that Southern Cal is seeing some nice meteors. Accounting and science both have their place!

**un1k3n:** You may have covered this...I just joined...how do we "hear" them on the video?

**Bill:** The meteors ionize the air around them as they burn up and these ionized air molecules reflect radio waves back to the HAM radio. As the meteor moves, the frequency changes, which accounts for the various sounds.

**un1k3n:** Are you seeing any on Ustream camera? I am not, but seeing them from my house. Perseids Fireball Cam has them, but I can't pick them out on Montgomery camera.

**Bill:** we have seen some on the Ustream camera tonight. And there are some at [www.spaceweather.com/video](http://www.spaceweather.com/video)

**jbessey2010:** well its officially raining in Malone NY no more meteors until tonight hopefully

**Bill:** Good luck with that tonight!

**BobKCO:** Thank you and NASA For hosting a great chat tonight, Bill! It's 2: 55AM in Colorado - time to enjoy the show on a clear, cool night. We really appreciate you lending your expertise to us. Cheers!

**Bill:** Thank you for being here!

**Soldier Lover:** Can you see the meteors in Iraq?

**Bill:** Not right now because of daylight, but tonight at local time 3-4 a.m., yes. : )

**Bill posts to the room:** Hi everyone -- thanks SO much for staying up all night with us to observe the Perseids. It's been great hearing about your experiences around the world as you watch the skies. Thanks for your patience on this very busy chatroom tonight. Have a great night!

**(Moderator Brooke):** Thanks to all of you for the great questions, and for staying up all night with NASA! A special thanks to our guest scientist, Bill Cooke. Check back in the next day or two for a posted transcript of tonight's chat. The Ustream live feed will be available for several more days. Sleep well!